NEBOSH International General Certificate in Occupational Safety and Health

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Element 3: Musculoskeletal Hazards & Risk Control.

Learning Outcomes

On completion of this element, candidates should be able to demonstrate understanding of the content the application of knowledge to familiar and unfamiliar situations. In particular they should be able to:

1. Explain work processes and practices that may give rise to work-related upper limb disorders and appropriate control measures.
2. Explain the hazards and control measures which should be considered when assessing risks from manual handling activities.
3. Explain the hazards and controls to reduce the risk in the use of lifting equipmrent and moving equipment with specific reference to manually-operated load moving equipment.
4. Explain the hazards and the precautions and procedures to reduce the risk in the use of lifting and moving equipment with specific reference to powered load handling equipment.

Recommended tuition time:

Recommended tuition time for this unit is not less than 6 hours.

1.0 Ergonomics.

Ergonomics - what is it?

Ergonomics is a branch of science that aims to learn about human abilities and limitations and then apply that knowledge to improve people's interaction with products, systems and environments.

Ergonomics is a relatively new branch of science which celebrated its 60th anniversary in 2009 but relies on research carried out in many other older established scientific areas, such as engineering, physiology and psychology.

It originated in World War 2, when scientists designed advanced new and potentially improved systems without fully considering the people who would be using them. It gradually became clear that systems and products would have to be designed to take account of many human and environmental factors if they were to be used safely and effectively. This awareness of peoples requirements resulted in the discipline of ergonomics.

Most people have heard of ergonomics and think it is something to do with seating or with the design of car controls and instruments. Whilst these subjects are covered by the science, its full scope encompasses much more. Ergonomics is the application of scientific information concerning humans to the design of objects, systems and environment for human use.

Ergonomics comes into everything which involves people. Work systems, sports and leisure, health and safety should embody all ergonomics principles if well designed.

Some years ago, researchers compared the relative positions of the controls on a lathe with the size of an average male worker. It was found that the lathe operator would have to stoop and move from side to side to operate the lathe controls. An ideal sized person to fit the lathe would be just 4.5 feet tall, 2 feet across the shoulders and have an arm span of 8 feet.

This example epitomises the shortcoming in design when no account has been taken of the user. People come in all shapes and sizes, and an Ergonomist takes this variability into account when influencing the design process.

In addition to physical size, Ergonomists look at strength, compatibility of controls, vision, sound, thermal comfort, motion, vibration and workloads.

Vision is usually the primary channel for information, yet systems are often so poorly designed that the user is unable to see the work area clearly. Many workers using computers cannot see their screens because of glare or reflections. Others, doing precise assembly tasks have insufficient lighting and suffer eyestrain and reduced output as a result.

Sound can be a useful way to provide information, especially for warning signals. However, care must be taken not to overload this sensory channel. A recent airliner had 16 different audio warnings, far too many for a pilot to deal with in an emergency situation. A more sensible approach was to have just a few audio signals to alert the pilot to get information guidance from a visual display.

Motion and vibration can have a detrimental effect upon the worker's efficiency, health and comfort, ranging from motion-sickness in vehicles to white finger for vibrating hand tool users. Chemicals, pollutants and Sick Building Syndrome also need to be taken into account in many working situations.

The Ergonomist's role is to study all aspects of the working situation and to fit the job to the human's attributes.

1.1 Matching the Workplace to Individual Needs of Workers.

Ergonomics sets out to ensure that tasks, equipment, information and the environment suit each worker.

To assess the fit between a person and their work, ergonomists have to consider many aspects, including:

- The job being done.
- The demands on the worker;
- The equipment used (its size, shape, and how appropriate it is for the task);
- The information used (how it is presented, accessed, and changed);
- The physical environment (temperature, humidity, lighting, noise, vibration);
- The social environment (such as teamwork and supportive management).

Ergonomists consider all the physical aspects of a person, such as:

- Body size and shape;
- Fitness and strength;
- Posture;
- The senses, especially vision, hearing and touch;
- The stresses and strains on muscles, joints, nerves.

Ergonomists also consider a person's psychological aspects, such as:

- Mental abilities;
- Personality;
- Knowledge;
- Experience.

Assessing physical aspects, jobs, equipment and working environment and the interaction between them enables ergonomists to design safe, effective and productive work systems.

Ergonomics is typically known for solving physical problems. For example, ensuring that work surfaces are high enough to allow adequate clearance for a worker's legs. However, ergonomics also deals with psychological and social aspects of the person and their work. For example, a workload that is too high or too low, unclear tasks, time pressures, inadequate training, and poor social support can all have negative effects on the person and the work they do.

Here are some examples that highlight typical ergonomic problems found in the workplace:

Display screen equipment.

- The screen is poorly positioned - it is too high/low/close/far from the worker, or is offset to one side.
- The mouse is placed too far away and requires stretching to use.
- Chairs are not properly adjusted to fit the person, forcing awkward and uncomfortable postures.
- There is glare on the screen from overhead lights or windows, increasing the risk of eyestrain.
- Hardware and/or software are not suitable for the task or the person using it, causing frustration and distress.
- Not enough breaks or changes of activity.

These problems may result in mistakes and poor productivity, stress, eye strain, headaches and other aches or pains.

Manual handling:

- The load is too heavy and/or bulky, placing unreasonable demands on the person.
- The load has to be lifted from the floor and/or above the shoulders.
- The task involves frequent repetitive lifting.
- The task requires awkward postures, such as bending or twisting.
- The load cannot be gripped properly.
- The task is performed on uneven, wet, or sloping floor surfaces.
- The task is performed under time pressures and incorporates too few rest breaks.

These problems may result in physical injuries such as low back pain or injury to the arms, hands, or fingers. The problems may also contribute to the risk of slips, trips, and falls.

Work-related stress:

- Work demands are too high or too low.
- The employee has little say in how they organise their work.
- Poor support from management and/or colleagues.
- Conflicting demands, e.g. high productivity and quality.
- Poor control of the risks causing work-related stress could lead to ill health and reduced performance and productivity.

Managing the working day:

- Not enough recovery time between shifts.

- Poorly-scheduled shifts.
- Shifts that clash with domestic responsibilities.
- Excessive overtime worked by employees.

These problems may lead to tiredness or exhaustion, which can increase the likelihood of accidents and ill health.

There are many ways in which ergonomic problems can be identified. Ideally, several approaches should be used:

Employees should be approached and their views sought. They are the best-placed to advise on the work they do, the problems they may have and the impact of those problems on health, safety and performance.

The work system should be assessed, using a series of simple questions such as:

- Is the person in a comfortable position?
- Does the person experience discomfort, including aches, pain, fatigue, or stress?
- Is the equipment appropriate, easy to use and well maintained?
- Is the person satisfied with their working arrangements?
- Are there frequent errors?
- Are there signs of poor or inadequate equipment design, such as plasters on workers' fingers or 'home-made' protective pads made of tissue or foam?

If there are frequent errors and incidents where mistakes have occurred and people have been injured, the circumstances surrounding them should be examined thoroughly. It is highly likely that there will be clues to the causes of those incidents in what has happened. Accident reports can be very useful in identifying details of incidents and their possible causes. Examination of sickness, absence and turnover records may also highlight areas for investigation.

If the employer thinks that an ergonomic problem has been identified, they should look for likely causes and consider possible solutions. A minor alteration may be all that is necessary to make a task easier and safer to perform.

For example:

- Provide height-adjustable chairs so individual operators can work at their preferred work height;
- Remove obstacles from under desks to create sufficient leg room;
- Arrange items stored on shelving so those used most frequently and those that are the heaviest are between waist and shoulder height;
- Raise platforms to help operators reach badly located controls;
- Change shift work patterns; and
- Introduce job rotation between different tasks to reduce physical and mental fatigue.

Employees should be consulted and their suggestions and ideas solicited. If they are involved from the start of the process, this will make it more likely that they will accept any proposed changes.

Any alterations should be properly evaluated by those who actually do the job.
Care should also be taken that a change that is introduced to solve one problem does not cause difficulties in another part of the workplace.

It is not always necessary to consult ergonomics professionals, and the expense of making changes can often be kept low. However, if a straightforward solution cannot be found, professional assistance is often the next step.

Ergonomics input does not necessarily involve high costs, and can save money in the long term by reducing injuries and absence from work.

An understanding of ergonomics in the workplace can improve the daily work routine. It is possible to eliminate aches, pains, and stresses at work and improve job satisfaction. Ergonomic solutions can be simple and straightforward to make - even small changes such as altering the height of a chair can make a considerable difference.

1.2 What Do Ergonomists Do?

Ergonomists use information about people, for example, their size (height, weight etc.), their ability to handle information and make decisions, their ability to see and hear and their ability to work in extremes of temperature. Ergonomists study the way that these things vary in a group of people. With this information the Ergonomists, working with designers and engineers, can ensure that a product or service can be used comfortably, efficiently and safely. This must be not only for 'average' people but also for the whole range of people who use the product - including perhaps, children, the elderly and the disabled. Ergonomists can also assess existing products and services, showing where they fail to 'fit' the user (in every sense of the word) and suggesting how this fit may be improved.

Age-related design.
The number of people in the UK aged 75 and over is forecast to double over the next 50 years. As such, there is a need to extend the range of application of equipment, services and systems designed for the general population.

Data needs to be available on relevant aspects of the capability of the whole population including older and disabled people. The aspects include the physiological (for instance, range of limb movement, strength, vision and hearing) and the psychological (for example, cognitive, reaction time, memory).

Anthropometric data is also required (size and shape ranges of people). With data such as this available, a knowledge base can be generated for access by conscientious designers.

1.3 The Built Environment.

This includes design of the home, design of public access buildings, public spaces, and design and operation of transport systems.

Physical aspects of design that need to be considered include stairs and ramps, hydrothermal conditions (cold, damp, heat), security and accessibility. Sensory aspects include acoustics, lighting, comfort, communication systems, signage and navigation. Quality of life for older and disabled people may also be enhanced by improvements in the built environment.

Why is the video recorder one of the most frustrating domestic items to operate? Why do some car seats leave you aching after a long journey? Why do some computer workstations confer eyestrain and muscle fatigue?

Such human irritations and inconveniences are not inevitable. Ergonomics is an approach which puts human needs and capabilities at the focus of designing technological systems. The aim is to ensure

that humans and technology work in complete harmony, with the equipment and tasks aligned to human characteristics.

Ergonomics has a wide application to everyday domestic situations but there are even more significant implications for efficiency, productivity, safety and health in work settings.

For example:

- Designing equipment and systems including computers so that they are easier to use and less likely to lead to errors in operation; particularly important in high stress and safety-critical operations such as control rooms.
- Designing tasks and jobs so that they are effective and take account of human needs such as rest breaks and sensible shift patterns as well as other factors such as intrinsic rewards of the work itself.
- Designing equipment and work arrangements to improve working posture and ease the load on the body, thus reducing instances of Repetitive Strain Injury/Work Related Upper Limb Disorder.
- Information design, to make the interpretation and use of handbooks, signs and displays easier and less error-prone.
- Design of training arrangements to cover all significant aspects of the job concerned and to take account of human learning requirements.
- The design of military and space equipment systems; an extreme case of demands on the human being.
- Designing working environments, including lighting and heating to suit the needs of the users and the tasks performed. Where necessary, design of personal protective equipment for work and hostile environments.
- In developing countries, the acceptability and effectiveness of even fairly basic technology can be significantly enhanced.

The multi-disciplinary nature of ergonomics is immediately obvious.

Ergonomists work in teams which may involve a variety of other professions:

- Design engineers;
- Production engineers;
- Industrial designers;
- Computer specialists;
- Industrial physicians;
- Health and safety practitioners;
- Specialists in human resources.

The overall aim is to ensure that our knowledge of human characteristics is brought to bear on practical problems of people at work and in leisure. We know that in many cases, humans can adapt to unsuitable conditions but such adaptation leads often to inefficiency, errors, unacceptable stress and physical or mental cost.

1.4 Types of Ergonomic Hazards.

Ergonomic hazards cause injuries that are commonly referred to by these terms:

- Repetitive Strain Injuries RSIs.
- Work Related Upper Limb Disorders WRULDs.
- Musculoskeletal Disorders MSDs.

1.5 Meaning of Musculoskeletal Disease & Work Related Upper Limb Disorders (WRULDs).

WRULDs are also called ULDs (Upper Limb Disorders), RSI (Repetitive Strain Injuries), or MSDs (musculo-skeletal disorders). It is a somewhat vague term under which a large variety of conditions and symptoms are classed.

Work Related Upper Limb Disorders (WRULDs) are complaints of the arm, hand and shoulder caused by undue loading of muscles, tendons and joints whilst Repetitive Strain Injuries (RSIs), they include injury to soft tissues, particularly the tendons which attach muscle to bone.

Some complaints involve diffuse but persistent pain in muscles and associated tissue. The sufferer may experience tenderness, but physical signs are often absent. Muscles in the neck, upper back and chest can also be affected. Pain may be felt both in these areas and in the hands and arms (referred pain).

Aspects of work linked with an increased risk of WRULDs include application of high manual force, unsuitable work rates/repetition for long spells and awkward or rigid posture.

A fundamental distinction can be made between those conditions with a specific recognised medical diagnosis and those of a so-called 'diffuse' nature which still lack a clear-cut diagnosis. Within the first category, the non-diffuse group, the following conditions are frequently encountered:

- Carpal tunnel syndrome;
- Tendonitis;
- Tenosynovitis;
- De Quervain's syndrome;
- Tennis elbow;
- Thoracic outlet syndrome and others.

All these are 'classic' conditions, well-recognised, with prescribed clinical tests and clear-cut associated symptoms. This is in contrast to the diffuse group of conditions, which largely escape the clinical tests and sophisticated medical investigation. The factors that are consistent in this group are:

- similarities in individuals' causative history;
- similarities in individuals' symptoms and symptom behaviour;
- often disappointing results to non-diffuse type treatment.

The diffuse group of conditions is characterised by a range of symptoms (ache, pain, tingling, cramps, numbness, heaviness, tightness and others) which tend to vary in location, intensity and nature.

It is typical for symptoms to 'jump around' and once established, to appear spontaneously without obvious trigger or cause. Symptoms are often felt 'deep' in the tissues and can be hard to describe by those who experience them.

Another aspect can be the emergence of symptoms generally associated with the sympathetic nervous system. Examples include the reporting of heaviness, hands feeling hot or cold, swelling and tightness, usually without any visible signs.

In contrast with conditions such as 'tennis elbow' and carpal tunnel syndrome, the structure at fault is not easily identifiable.
Difficulties with diagnostic tests and changing symptoms have in the past led some people to believe that this condition is predominantly 'in the mind' rather than reflecting a physical injury.

Even though psychological factors do play a role, recent research has clearly identified measurable nerve function deficits.

1.6 Work-Related Upper Limb Disorders.

How Common are WRULDs?

It has recently been estimated by the Trades Union Congress (TUC) that over 150,000 people each year suffer symptoms of repetitive strain injury (RSI) or work related upper limb disorder (WRULD) in the UK.

However, in the past year, only 3,000 people managed to make a successful case for compensation.

For every person who wins compensation for RSI, another fifty suffer in silence, according to the TUC. Therefore, the number of workers receiving compensation for RSI is believed to be the tip of the iceberg, compared with the number actually suffering.

According to the TUC, British business loses £1 billion a year through loss of production and skilled workers. Most compensation awards include only £2,500 - £7,500 for pain and suffering in addition to loss of earnings and the cost of future care.

The workers known to be most at risk are those on small assembly lines (for example, doing rapid packaging or food processing) and those using a keyboard and/or mouse (such as typists, journalists and office workers).

In a recent Health and Safety Executive study (quoted by the Labour research department), it was found that there was a particularly high prevalence of these disorders among keyboard users. In the study, almost 55% of the workers had had problems with RSI at some time, and 49% had experienced symptoms in the past three months.

As well as costing business dearly, RSI or WRULD can affect individuals' lives causing much pain and disability and could possibly even put an end to their chosen career. Much of the suffering and cost is avoidable through good workplace design, teaching employees how to set up their workstations correctly, encouraging good working practice, such as regular breaks or periods of different work, and providing prompt rehabilitation for workers reporting symptoms. Moreover, it is now well recognised that factors such as work rate, a lack of control over the process, tight deadlines and other factors causing mental stress for operators can also increase the likelihood of an operator developing RSI or WRULD.

Jobs or tasks where there could be an increased risk of WRULDs include:

- Hand feeling and unloading of machines, e.g. folding, gluing and binding equipment.
- Assembly work.
- Counting, sorting and checking tasks.
- Stripping, breaking out or knocking out, e.g. waste removal at cutting and creasing operations.
- Knocking up, e.g. before stacking, machine feeding or before wrapping or packing.
- Flat packing, e.g. wrapping reams of paper.
- Packing into cartons.
- Handling of bundles or packages.
- Hand insertion work, e.g. of leaflets into newspapers and periodicals.
- Hand stuffing of envelopes.
- Keyboard work, e.g. typesetting, sub-editing and tele-ad work.
- Jacketing of cased books.

This is not an exhaustive list. Nor does it imply that WRULDs will necessarily occur in these tasks.

A hamstring strain or a pulled hamstring as it is sometimes called is a tear in one of the hamstring muscles (Semitendinosis, Semimembrinosis and Biceps femoris) in the back part of the upper leg. It

often results from an overload of the muscles or trying to move the muscles too fast.

Strains are common in heavy lifting at work, especially ones where poor lifting techniques are used.

Missing diagram - hamstring picture

1.7 Risk Factors.

In spite of the wealth of information and opinions on diffuse WRULDs, the current medical understanding of exactly how this condition is caused, what the damage consists of and how to determine a prognosis, is still very limited. However, 3 groups of risk factors have been identified and are generally accepted as such.

These are:

- Static muscle loading;
- Overuse and repetition;
- Stress.

These risk factors are identical for both the diffuse and the non-diffuse conditions. There is anecdotal evidence to suggest that people using the keyboard and mouse are more likely to develop a diffuse condition. Those working in an industrial setting seem to be more likely to develop a more specific form of WRULD. This is likely to be related to the different 'mix' of risk factors in these settings.

1.8 Static Muscle Loading.

Static muscle loading describes muscular activity which focuses on holding an object or on maintaining a certain posture or position which involves little or no movement.

The problem with this form of activity is related to the muscle structure and the way muscles work. For muscles to be able to contract, they require energy in the form of adenosine triphosphate (ATP) which is delivered to them via the blood circulation. When muscles contract, they effectively compress the blood vessels which feed them and if a contraction is maintained for any length of time, as during static activity, their blood supply is reduced and a build-up of waste products can accumulate. This results in muscle fatigue and can be experienced as an ache or discomfort.

Computer work tends to be more static and less varied than clerical or administration work and can cause static muscle loading in a variety of body areas unless regular breaks and changes in activity occur. When using the keyboard, static muscle work is required to hold the arms and hands in place. Furthermore, if the back is not well supported, static muscle activity will occur there and in the muscles of the neck. Over time, this can lead to localised muscle tightness and postural imbalances, which can compromise the blood supply and the nerve function in the arms and hands

1.9 Overuse & Repetition.

Overuse of specific muscles and repetition of certain activities can carry the risk of straining tissues beyond their normal capacity.

Initially, fatigue occurs and - if demands increase, or sufficient changes in activity or breaks are not

provided - then aches, pains and injury can result.

Any repetitive task performed continuously, without sufficient breaks or changes in activity, will place demands on specific structures and result in a risk of injury.

The way in which an activity is performed will affect the likelihood of a problem occurring.

As an example, we can use the angle of the wrist while typing or using the mouse. With the wrists in a neutral position, the risk of an overuse problem is greatly reduced compared with typing or using the mouse with wrists extended or deviated. This is due to the affected structures working in a neutral, relaxed position, causing minimal compression or stretch and requiring minimal effort and muscle activity.

Examples of repetitive operations:

- Keyboard operation
- Assembly of small components
- Bricklaying and checkout operators
- Assessment of a display screen equipment workstation

1.10 Stress.

Stress and other psychological factors, perhaps surprisingly, can play an important part in the onset and experience of WRULDs too.
This is due to stress causing increased muscle tension and generally sensitising the nervous system, which leads to an increased perception of pain. Stress factors, whether related to work, family or any other area, can therefore be important contributors to WRULDs.

The reason why this condition has been particularly prominent among computer users is probably due to the fact that often all three of these risk factors are present in the modern office environment.

1.11 - Video: ULD (WRULD).

1.12 RSI, WRULD & MSD Risk Factors.

Each of the risk factors described here can cause problems. However, it is usually the case that workers are exposed to more than one risk factor at a time.

Repetitive motion: This refers to performing the same motion or motion pattern every few seconds or on a continuous basis for hours at a time.

Awkward posture: Whether standing or sitting, there is a neutral position for the back, neck, arms and hands. This is the position that puts the least amount of physical strain on the particular part of the body. Postures that differ from the neutral position increase stress on the body
Overhead work, twisted or bent back, bent wrists, squatting or stooping are examples of body positions and movements that cause problems. (Figure 1).

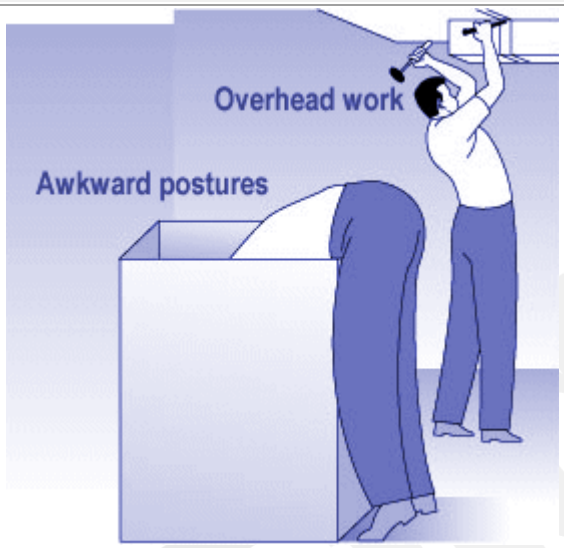

Figure 1.

Long periods of repetitive activity (duration): This is the amount of time workers perform a motion or movement pattern during the workday.

Lack of recovery time: Recovery is rest or a break from a risk factor.

Forceful movement: This is the effort or pressure workers need to perform various tasks. Forceful movements include lifting a heavy object, unscrewing a rusted bolt or squeezing an object in your hand. Another type of force, known as contact stress, comes from pressure against a part of the body. For example, resting the wrists against the sharp edge of a desk while working at a computer puts pressure on the wrists.

Vibration: Exposure to vibration can affect particular parts of the body, such as the hands, when using power tools. This is known as localised vibration. Workers who drive trucks or work with jackhammers are exposed to whole body vibration.
Uncomfortable environmental conditions: An uncomfortable environment can be dangerous as well as unpleasant. High temperature and humidity can make workers drowsy and less alert. Excessive noise damages hearing. Glare and bright lighting while working with computers can cause headaches and vision problems.

Stressful work organisation: This refers to the way jobs are organised. These factors include staffing levels, scheduling workload and job pacing, electronic monitoring, performing monotonous tasks and the amount of control workers have over how they perform their jobs. These are sometimes called psychosocial factors.

1.13 Injuries Caused by Poor Ergonomics.

The table below lists common ergonomic injuries of the hands, arms and shoulders.

Common Repetitive Strain Injuries		
Repetitive Strain Injury	**Symptoms**	**Risk Factors**

Carpal Tunnel Syndrome	pain, numbness, tingling in the hands, weakness and clumsiness of the hands.	repetition, working with wrists bent, and/or forceful hand movements.
Ganglion Cysts	swelling that forms a lump on the wrist.	repetition and working with wrists bent.
De Quervains Disease	pain and inflammation at the base of the thumb.	repetition of a clothes-wringing motion.
Raynauds Syndrome/ White Finger	loss of control and feeling in fingers and hands, numbness or tingling in the fingers.	forceful gripping, vibration, cold and/or wet environment.
Trigger Finger	pain and inflammation on the palm side of index finger.	forceful gripping of hard/sharp edges, repetition.
Tendinitis	pain and inflammation in any joint such as elbow, wrist, knee, etc.	repetition and awkward posture.
Tennis Elbow (epicondylitis)	pain and inflammation in elbow.	repetition, rotation of forearm, or force.
Rotator Cuff/Tendinitis	pain and restricted motion in shoulder, may lead to arthritis.	repetition, overhead work, or working with arms in a winging motion

1.14 Steps to Solving Ergonomics Problems.

Implement an ergonomics programme.

Form an Ergonomics Team:

An ergonomics team should be made up of representatives from management and the workforce. It should also include individuals who are knowledgeable about ergonomics and the medical treatment of ergonomic injuries.

A comprehensive ergonomics programme includes:

- Training to increase ergonomic awareness and build in-house expertise;
- Collecting information on employees' injuries and discomfort;
- Identifying risk factors in the workplace that are causing injury and discomfort;
- Giving workers input into how they do their jobs;
- Developing ways to control ergonomic hazards by modifying equipment, the office environment, and the organisation of work;
- Implementing a medical management programme to identify RSI (repetitive strain injuries) early and ensure appropriate medical treatment;
- Identifying or creating light duty positions and making other job accommodations;

- Evaluating the effectiveness of the ergonomics programme.

1.15 Finding Ergonomic Injuries & Causes.

Raise Awareness of Ergonomics by Training Workers and Supervisors.

Workers and their supervisors should receive training about the causes and prevention of RSIs.

The training should cover:

- Signs and symptoms of RSIs;
- Use and adjustment of equipment;
- Breaks and other ways to reduce the amount of time they are exposed to ergonomic risks;
- Activities such as stretching and life style changes that reduce the risk of RSIs;
- Reporting symptoms to the employer's designated person;
- Procedures to request an ergonomic evaluation of their job, of the equipment, get medical help or other policies.

Collect Information on Employees' Injuries and Discomfort.

Find out which workers have been injured or are having pain.

The information can be obtained by:

- Looking for repetitive strain injuries in your accident book;
- Checking workers compensation records;
- Conducting a survey of symptoms.

1.16 Identify Risk Factors in the Workplace that Cause Injury & Discomfort.

A job analysis means taking a close look at a job to see what conditions are causing problems. It is important to look at all the tasks that are part of a job. For example, to find the cause of carpal tunnel syndrome for library clerks, the job analysis should look at computer work, book handling and other repetitive tasks performed with the hands.

A sample job analysis checklist for computer operators is below.

The main risk factors to look for are:

- Repetitive motion;
- Awkward posture;
- Long periods of repetitive activity (duration);
- Lack of recovery time;
- Forceful movement;
- Vibration;
- Uncomfortable environmental conditions;
- Stressful work organisation.

1.17 Control Ergonomic Hazards by Modifying Equipment & Organisation of Work.

As with chemical or other hazards, management should eliminate ergonomic hazards with equipment that gets rid of the risk. Other control measures include work organisation and training.

1. Equipment can control ergonomic risks

The following are examples of equipment that can get rid of or reduce ergonomic risks:

- Patient lifting devices;
- Transfer boards to move patients from beds;
- Truck with hydraulic tailgate;
- Adjustable computer and furniture;
- Tools with bent handles, allows worker to keep wrists straight.

Diagram missing

1.18 Controlling Ergonomics Presentation.

Video missing

1.19 Control Ergonomic Hazards by Organisation of Work.

2. Work organisation changes.

The way work is done can be changed without requiring different equipment.

Here are some examples:

- Buy supplies in smaller containers to reduce the weight of materials that must be lifted.
- Have a lifting team to move patients.
- Take frequent rests from using the keyboard and mouse.
- Rotate jobs.

hands grasp

Diagram missing

1.20 Control Ergonomic Hazards by the Organisation of Work. cont.

3. Use safe lifting techniques to prevent back injuries.

- Before lifting, make sure your path is dry and clear of objects that could cause a fall.
- Bend your knees and keep your back straight. (Lift with your legs, not your back.)
- Bring the load close to your body.

- Lift in a slow, even motion.
- Dont twist your body. If you must turn, move your feet.
- Keep your back straight when putting down the load.

WARNING: Safe lifting techniques are not enough to prevent back injuries. The use of safe lifting techniques is often not practical, especially when lifting patients. Also, the greatest cause of back injuries is total weight lifted. When people are lifting too much, even using proper techniques may not prevent a back injury.

1.21 Ergonomic Training.

A complete ergonomics programme includes:

- Training workers and their supervisors about ergonomics.
- Collecting information on injuries and symptoms.
- Evaluating jobs to find the working conditions that are causing problems (job analysis).
- Changing equipment and the way work is done to prevent or reduce injuries.
- Giving workers input into how they do their jobs.
- Providing the right medical treatment to injured workers as early as possible.
- Identifying light duty positions and making other job accommodations.
- Keeping track to see if there are fewer injuries and symptoms.

1.22 Video: Ergonomics.

Video missing

1.23 Appropriate Control Measures.

Actions to be taken to control Work Related Upper Limb Disorder (WRULD) risks

European Agency for Safety and Health at Work

Workstation	**Repetitive movements**
Ensuring that working heights are appropriate for the full range of workers. Relocating equipment to provide more space. Relocating items that workers have to see clearly within their comfortable range of vision. Providing adjustable workstations that allow postures to be varied between standing and sitting.	Mechanising or automating repetitive processes. Rotation of workers between tasks with high and low exposures. Allowing adequate rest pauses.
Temperature	**Use of muscular force**

Avoiding handling or insulating cold items or equipment. Directing warm/cool air flow (as appropriate) to the worker to increase thermal comfort.	Reducing the weight of items. Using jigs or counterbalances to hold items. Using stronger muscle groups to perform the task. Using foot pedals as opposed to hand controls. Using more effective tools that need less muscular power; for example. tools with engines or other mechanical advantage.
Hand tools	**Postures**
Providing tools with ergonomically designed handles. Using lighter tools, or providing supports or counterbalances. Ensuring tools are regularly maintained.	Relocating equipment or items that must be held to within easy reach. Ensuring working heights are at or around waist level. Ensuring workplaces and equipment are suitable for the full range of workers' sizes and strengths. Providing jigs for re-positioning work pieces. Ensuring that items that must be viewed clearly are within the normal visual range.
Vibration	**Mechanical pressure**
Using vibration-damped equipment. Ensuring tools are regularly maintained. Limiting exposure to agreed safe limits	Providing suitable hand tools as effective substitutes for the use of inappropriate parts of the body. Ensuring that edges on work pieces and equipment items are rounded to distribute pressure during contact with parts of the body.
Gloves	**Organisation of work**
Providing gloves in a wide range of sizes to fit workers' hands. Providing gloves made from flexible materials	Improving work flow to avoid production peaks and troughs through better planning and scheduling. Encouraging better communication and team work Providing appropriate training.

2.0 Introduction to Manual Handling

The definition of 'manual handling operations' is broadly drawn:

"...any transporting or supporting of a load (including the lifting, putting down, pushing, pulling, carrying or moving thereof) by hand or by bodily force".

Diagram missing

Can you think of an industry or business that does not undertake manual handling activities?

You would be hard pressed to come up with one. All industries - to some degree or other - require employees to lift, carry, push or pull loads.

Offices need paper, in most cases. That paper has to be delivered to someone at the office and stored somewhere within the office. How much does a ream of paper weigh? What about a box of five reams of paper? What about other office supplies?

We started with what you might consider as a low risk environment as far as manual handling is concerned, but read on.

A safety consultant is arranging training in basic health and safety for a large company. He first visits the site to have a look around and ensure that his discussions are relevant and something to which the staff could relate.

The first port of call is the reception staff and their work activities. They answer the telephone, deal with visitors and keep the appearance of the reception area tidy and presentable.

The reception staff, two young women, take the delivery of the daily post. As this is a large company, the post comes in two large red Royal Mail sacks. Now there is a manual handling section of training to consider.

There are many ways to identify hazards and to calculate the risks, but in this case the consultant decides to speak to the reception staff and discover just how they deal with the post each day.

Each sack weighs about 15kg each. The reception staff have to carry each sack from the reception area, through a door, along a corridor some 20 metres, up two flights of stairs, along another corridor, through two other doors and place the sacks in the post room. Once the job is done they return to the reception desk.

They do this every day, five days a week. The weight of the sacks is unpredictable, bulky, hard to grasp in some cases. Although the flooring is even in the corridors, the doors open towards them and in the upper corridor the space is not good; half of it is partially blocked by a photocopier.

A certain amount of ducking and weaving, twisting and bending is involved. Also in the opinion of both women, their individual capacity is at full stretch some mornings. 15kgs might not sound a lot, but when the distance and obstacles are taken into account, it can take its toll. A wrong twist of the back or upper limb could mean days of pain or even worse.

The consultant discusses this with the Manager responsible, who comes up with a simple solution. He will allocate one of the male members of staff from the warehouse to undertake the task each day. This is a step in the right direction, but another idea might be to ask the post office to deliver in lighter sacks, or allocate a room on the ground floor as the post room.

The manager also needs to remember to reassess the tasks of the reception staff, should things change; expectant mothers require specific assessments to be undertaken, particularly when it comes to lifting and carrying.

2.1 Manual Handling Hazards, Risks & Control Measures.

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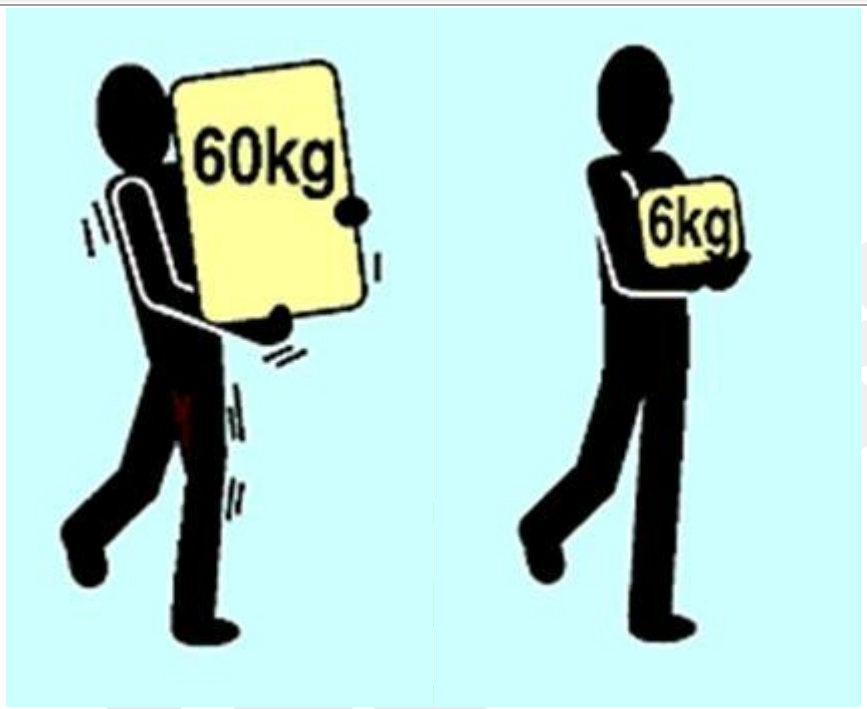

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2.2 Lower Back Problems.

Pain in the lower back, or lumbar region, is the most common work-related back problem. Low back pain occurs due to a variety of injuries and illnesses. Muscles and ligaments in the back can be injured and cause pain.

Injuries and illnesses affecting discs and nerves are also very painful. Discs can deteriorate, or a disc can stick out and press on nerves. This condition is called a prolapsed disc, which is sometimes called a slipped disc. Problems with the spinal column can also cause pressure on nerves.

Diagram missing

Lifting, pulling, pushing, bending and twisting are factors that cause lower back pain. These movements involve the risk factors of force, repetition and harmful posture. Vibration is another condition that can lead to back pain.

Question 1.

Please select the correct missing words, in order, for the sentence below:

The definition of '_____ handling _____' is broadly drawn: ...any _____ or supporting of a _____ (including the lifting, putting down, _____, pulling, carrying or _____ thereof) by hand or by _____ force'

Jumbled Sentence (HP)

Answer 1:	Manual Operations Transportation Load Pushing Moving Bodily

Response 1:	
Jump 1:	Next page

Question 2.	
Manual handling includes...	
Multiple Choice (HP)	
Answer 1:	Lifting and lowering
Response 1:	
Jump 1:	This page
Answer 2:	Pushing and pulling
Response 2:	
Jump 2:	This page
Answer 3:	Carrying
Response 3:	
Jump 3:	This page
Answer 4:	All of the above
Response 4:	
Jump 4:	Next page

2.3 Causes of Accidents.

The most common causes of accidents from manual handling operations are as follows:

- Slips, trips and falls.
- Poor lifting techniques.
- Loads which are too heavy for the individual undertaking the task.
- Unexpectedly heavy loads.
- Poor posture.
- The environment.

Can you think of any others?

For the NEBOSH examination, we recommend that you are able to add another four or five items to this

list. (Think back to the mail delivery example).

Again, for your NEBOSH test paper, you will be expected to suggest a number of occupations where employees are particularly at risk of manual handling injuries, such as:

- Construction workers.
- Postal workers, refuse collectors, furniture movers, etc.
- Warehouse workers.
- Care and health workers.

Can you think of the type(s) of hazards that may apply to the above?

You will need to prepare your own list of common accident causes and the type of work at particular risk.

Don't just consider the heavy tasks; many manual handling problems involve small loads - those ergonomic problems being caused by repeated awkward stretching for components on an assembly line, uncomfortable twisting to operate machinery, and so on.

2.4 Common Types of Manual Handling Hazard & Injury.

Most injuries will fall into one or more of the following categories:

- Cuts and abrasions, mostly involving the upper body and limbs.
- Fractures, either as a result of falls or dropping heavy objects onto the body.
- Strains and muscle injuries involving the spine.
- Strains and muscle injuries involving other parts of the body.

"The most common cause of absenteeism and doctors' consultations are back and sciatic pain. 300,000 people in Great Britain will have today off work due to back/sciatic pain - 1 in 5 people visiting their doctor will complain of it"

- Back pain. The causes are many and various, but without exception it will be aggravated by poor posture, inadequate support and poor working practice. In other words, bad ergonomics. It is important to maintain the correct spinal posture (the S-curve) shown in this diagram.

- Low back and sciatic pain. Frequently increased by leaning forward and closing the angle between the trunk and the thighs. Desk/keyboard users spend a lot of their time in this position as their chairs have a horizontal seat and their knees are level with their hips.

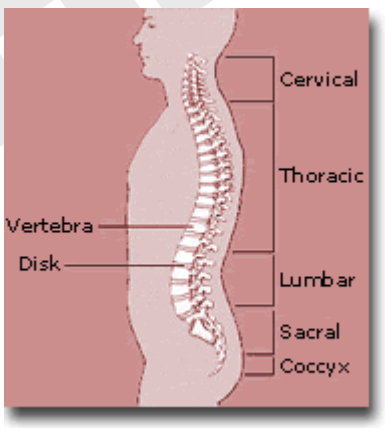


Figure 1.

2.5 Common Types of Manual Handling Hazard & Injury Continued.

When working:

- Think about sitting back at work, with your back fully supported by your chair.
- If you are using a keyboard, you can also support your elbows on adjustable armrests, taking the stress off your shoulders.
- Angle the keyboard slightly and you can still type with straight wrists.
- If reading or writing, lean back, move under the desk a little and use a writing slope to bring your work up to you.

Figure 1. Healthy and Damaged Vertebrae.

2.6 The Worst Excuse in the World ?

We lean forward to work, hanging on our muscles and ligaments, because we have always done so.

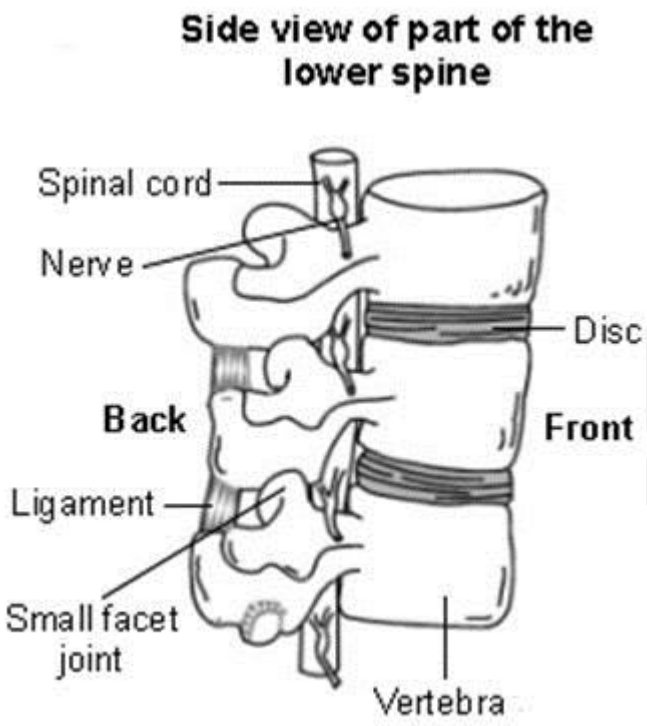


Figure 1. Side View of Part of the Lower Spine.

As a matter of interest, a muscle injury caused by, say, lifting too many sacks of cement, would not be classified as a Repetitive Strain Injury (RSI), a term which should be reserved for injuries caused by the rapid muscle movements associated with activities such as typing, operating vibrating hand-held equipment and vehicles, and so on.
On the subject of back/spine injuries.
Don't worry about going into detail with regards to the various types of back injury and illness. It is not necessary at certificate level. In fact, unless you are really knowledgeable about basic physiology, our advice is to keep it simple and to steer clear of terms such as: slipped disc, sciatica, trapped nerve, fibrositis and so on and restrict yourself to more general terms: backache, muscle injuries and so on; hernia (rupture or tearing of the abdominal wall) is a more specific term but one which is generally understood and used correctly.
UK Law requires that the assessment should be suitable and sufficient and those undertaking the assessment can ensure that this requirement is met by achieving the sort of detail that you have been considering above.

Question 3.	
Manual handling assessments need only be concerned with heavy loads as light loads never cause problems.	
True/False (HP)	
Answer 1:	True
Response 1:	
Jump 1:	This page

Answer 2:	False
Response 2:	
Jump 2:	Next page

2.7 Description of the Spine.

This is a simplified diagram of the spine. Note the spine consists of:

- the **vertebrae**, solid bones which have attachments for muscle. tendons;
- the **discs**, which are jelly-filled sacs between the vertebrae; these allow for movement and shock-absorption;
- **muscles**, and the **tendons** which connect them to the vertebrae;
- the spinal cord which connects the brain to the rest of the body and runs down through the vertebrae, between the discs and the muscles.

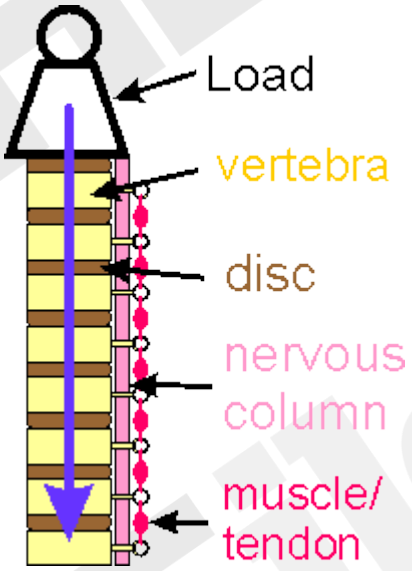


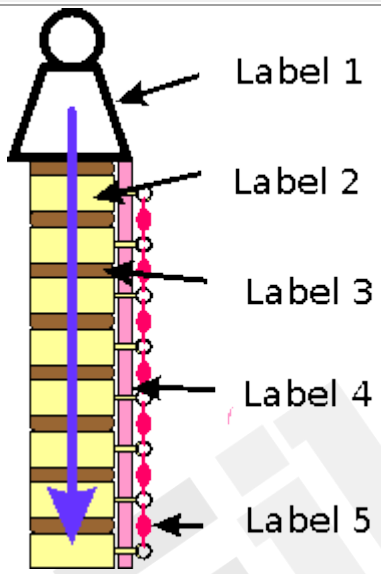
Figure 1. Simplified Diagram of the Spine.

In this first example, the load is carried on top of the spine. The blue arrow shows how the force tends only to **compress** the spine. This means that the discs are evenly loaded and the muscles and tendons are relaxed. The spine can take big loads safely when loaded like this.

Question 4.

Correctly label this simplified diagram of the spine by selecting the words to corresponding with the

labels.



Matching (HP)First answer should jump to the "Correct" Page	
Answer 1:	Label 1:
Matches with answer 1:	Load
Correct answer score:	0
Correct answer jump:	Next page
Answer 2:	Label 2:
Matches with answer 2:	Vertebra
Wrong answer score:	0
Wrong answer jump:	This page
Answer 3:	Label 3:
Matches with answer 3:	Disc
Answer 4:	Label 4:
Matches with answer 4:	Nervous Column

Answer 5:	Label 5:
Matches with answer 5:	Muscle Tendon

2.8 Spinal Effects of Lifting whilst Leaning.

In this next diagram, the spine is leaning over, though in a straight line. See that the muscles now have to work to stop the spine bending (muscles can only contract, not expand).

This means that the discs are now compressed from below by the load, and from above by the contracting muscles. Because the muscles are very close to the vertebrae, they exert a lot of compressive force in order to resist the bending.

Conversely, even quite a light load creates enormous tensile forces in the muscles and tendons, because of the leverage. Pressure in the discs is very high because the weight of the load is magnified many times by the geometry of bending.

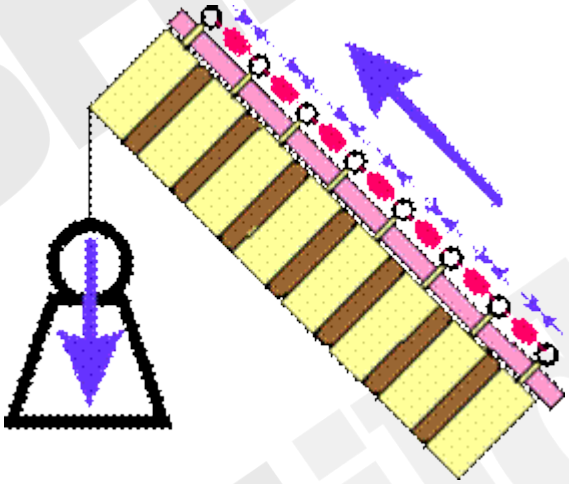


Figure 1. The Spine. leaning over.

The strain on the muscles and tendons can be more than they can take without tearing, and stress damage can accumulate at a rate faster than it can be repaired.

This can lay the foundations of an acute back-pain attack which may be triggered later by some unrelated and even trivial movement, disguising the real cause.

2.9 The Effects of Poor Lifting on the Spine.

This last diagram shows how most of us lift things and how so many of us get bad backs. The spine is leaning over and bent, stretching the muscles and tendons and squeezing the discs.

The squeezing of the discs raises the pressure inside even higher, reducing their nutrition (which mainly comes through the walls not through a blood supply) and making them prone to bursting (a herniated or 'slipped' disc). The escaping bubble of disc wall can then press on the spinal cord creating pain that is often felt in some other part of the body ('referred pain' called sciatica). The discs

themselves have few nerves, so you can't feel this damage happening until it's too late.

Herniated discs will normally repair themselves, **as long as** the stresses that caused the damage are not being repeated.

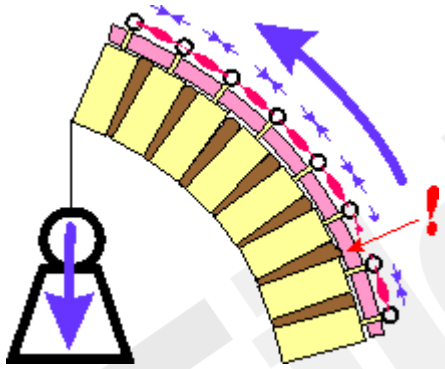


Figure 1. Bent Spine

A herniated disc is also called a 'slipped' disc or a 'prolapsed' or 'ruptured' disc.

It is a bulge in the wall of one of the discs between the vertebrae, often pressing onto the nerve.

It is characteristically caused by lifting with a bent spine, though the final trigger may appear to be unrelated to this.

The main symptom is 'sciatica' - referred pain, numbness or paralysis in the legs or buttocks.

Often, other damage occurs at the same time, so that muscle spasm and pain from damaged muscle and ligament are also experienced.

2.10 Risk Assessment.

Person(s) responsible for the assessment.

In most cases, employers should be able to undertake their own assessments in-house, having given their assessors adequate training to carry out the task.

A suitable assessment can only be based on a thorough practical understanding of the type of manual handling tasks to be performed, the loads to be handled and the working environment in which the tasks will be carried out.

Employers, managers, supervisors and team leaders should be in a good position, because of their knowledge of their work area, to carry out that task.

Remember, one of the best sources of information regarding tasks and hazards is the employees. They are the ones who actually undertake the work.

2.11 Suggested Measures to Prevent/Reduce Injury.

Suggested measures to prevent/reduce injury can easily be remembered by using the TILE

acronym:

'TILE' stands for:

- **T**ask.
- **I**ndividual capacity**.**
- **L**oad**.** &
- **E**nvironment.

The Task:

1. Redesign workplace layout.
2. Load to be placed in front of handler, as close as possible.
3. Handler to be able to walk around or rotate object.
4. Increase the workspace so feet and whole body can turn. If seated, give swivel chairs.
5. Raise working surface or provide adjustable height tables, re-design storage facilities/work place layout.
6. Lower storage level, raise working height of handler.
7. Provide mechanical aids e.g. trolleys or mid-point rest tables. Relocate work areas (make closer).
8. Provide mechanical aids, slides/chutes/rollers/trolleys, reduce size/weight of load, increase weight/size of load to force use of mechanical aid.
9. Provide adequate rest periods.
10. Vary tasks.
11. Specify team lift.

The Individual:

1. Health/pregnancy.
2. Age, strength, capacity.
3. Training on safe systems of work, manual handling.

The Load:

1. Reduce weight (or increase it excessively to force use of mechanical aids).
2. Provide handles.
3. Modify load.
4. Reduce size.
5. Pack contents so no shifting likely.
6. Prevent release if hazardous substances, e.g. dust.

The Working Environment:

1. Re-design workplace layout.
2. Modify floor surface.
3. Ensure adequate lighting.
4. Consider weather conditions, e.g. wind,rain,
5. Ensure good house keeping.

Work Organisation:

1. Re-design task to take account of personal protective equipment.
2. Train staff to team lift.
3. Ensure members of staff are available.
4. Plan the job.

5. Train staff to assess situations.

2.12 Risk Assessment in Practice.

Lets us now consider the process of manual handling risk assessments.

Remember the simple steps that apply:

1. Identify the hazards (anything with the potential to cause harm).
2. Take account of the person or persons that may be at risk.
3. Consider the control measures that are currently in place.
4. Assess the risks (the likelihood of the hazard causing actual harm or loss).
5. Implement additional controls to eliminate the risk or reduce the risk to an acceptable level.
6. Make a record of the assessment.
7. Maintain the assessment, monitor the activity assessed for changes.

This is a simple step-by-step approach and is offered as a reminder. You should refresh your study of risk assessment in practice in the relevant study book. Also consider the guidance to manual handling.

Let's just have a quick look at a work situation. Consider each part in turn, and note what hazards you may look for with regards to lifting, carrying, pushing and pulling etc.

- A container lorry arrives at the loading bay.
- The container is carrying 100 computer monitors in cardboard boxes.
- They are not stored on pallets so are required to be manually handled off the lorry.
- They are also required to be stored in the warehouse and made ready for quality checks.
- After inspection, they will be forwarded to the shops for sale.

Although you can't actually see what is going on, you should be able to imagine the scenario.

What questions do you have?

Here are some for you to think about:

- Why are boxes not on pallets? This would have saved a lot of re-handling.
- How much does each box weigh?
- Are they all the same weight?
- How secure are the boxes, will they split or collapse when carried?
- How big are the boxes?
- How far do they have to be carried into the warehouse?
- Will people have to stoop, twist, reach upwards and how often?
- Are any movements in the load likely to be unpredictable?
- Are the boxes difficult to grasp, unwieldy etc?
- What are the floor conditions like? Flat, any steps stairs or differences in height?
- What are the environmental hazards, is it cold/hot, windy, rainy?
- How many people are needed to off-load the truck? Can they all work safely in the space available?
- What about the quality checks? How can it be made easier to handle the boxes next time?
- Who - as an individual - is going to undertake the task?
- What might be the injuries?
- What is the likelihood of the hazards occurring?
- Can any be avoided?

Manual Handling Of Loads Assessment Checklist.

Manual Handling of Loads.

Note:
This checklist will remind you of the main points to think about while you:

- Consider the risk of injury from handling operations;
- Identify steps that can remove or reduce the risk;
- Decide your priorities for action.

SUMMARY OF ASSESSMENT.	Overall priority for remedial action: Nil / Low / Med / High*.
Operations covered by this assessment:	Remedial action to be taken:
Locations:	Date by which action is to be taken:
Personnel involved:	Date for reassessment :
Date of assessment:	Assessors name: Signature:

** circle as appropriate*

Section A - Preliminary:

Q1 Do the operations involve a significant risk of injury? Yes / No *

If **Yes** go to Q2. If you are sure the answer is **No,** the assessment need go no further.

If in doubt, answer **Yes**.

Q2 Can the operations be avoided/mechanised/automated at reasonable cost? Yes / No *

If **No,** go to Q3.

If **Yes,** proceed and then check that the result is satisfactory .

Q3 Are the operations clearly within the guidelines in Appendix 1 & 2? Yes / No *

If **No,** go to Section B. (Section B can be found in the following unit (Unit.1.14))

If **Yes,** you may go straight to section C if you wish.

Section C - Overall assessment of risk:

Q What is your overall assessment of the risk of injury? Insignificant / Low / Med / High *

If not **insignificant,** go to Section D.

If **Insignificant,** the assessment need go no further.

Section D - Remedial action:

Q What remedial steps should be taken, in order of priority?

I.
Ii.
Iii.
Iv.
V.

2.14 Manual Handling Checklist continued.

And finally:

- Complete the SUMMARY above.
- Compare it with your other manual handling assessments.
- Decide your priorities for action.
- **TAKE ACTION AND CHECK THAT IT HAS THE DESIRED EFFECT**

Section B - More detailed assessment, where necessary:					
Questions to consider: (If the answer to a question is Yes, place a tick against it and then consider the level of risk).		**Level of Risk** (Tick as appropriate)			**Possible remedial action:** (Make rough notes in this column in preparation for completing Section D)
	Yes	**Low**	**Med**	**High**	
The tasks - do they involve:					
Holding loads away from trunk?					
Twisting?					
Stooping?					
Reaching upwards?					
Large vertical movement?					
Long carrying distances?					
Strenuous pushing or pulling?					
Unpredictable movement of loads?					
Repetitive handling?					
Insufficient rest or recovery?					
A work-rate imposed by a process?					
The loads - are they:					
Heavy?					
Bulky/unwieldy?					
Difficult to grasp?					
Unstable/unpredictable?					
Intrinsically harmful (e.g. sharp/hot)?					
The working environment - are there:					
Constraints on posture/cramped conditions?					

Poor floors?					
Variations in levels?					
Hot/cold/humid conditions?					
Strong air movements?					
Poor lighting conditions?					
Individual capability - does the job:					
Require unusual capability?					
Hazard those with a health problem?					
Hazard those who are pregnant?					
Call for special information/training?					
Other factors -					
Is movement or posture hindered by clothing or personal protective equipment?					
Deciding the level of risk will inevitably call for judgement. The guidelines in Appendix 1 and 2 may provide a useful yardstick.					
When you have completed Section B go to Section C.					

2.15 Factors to Consider for a Risk Assessment.

The following sections contain information, all of which should be considered when undertaking a manual handling risk assessment.

2.16 Large Vertical Movement of the Load.

The ideal height for handling of a load is around waist height. Lifting or lowering a load outside this range requires greater physical effort and increases the likelihood of injury.

Where a load has to be lifted or lowered through a wide height range, it will normally need to be handled outside this preferred zone. In this case, the weight of the load should be limited to that which can safely be handled at the least favourable height.

Movement of loads can be made easier by arranging storage areas. Significant variation in the height of storage or working surfaces should be avoided where possible. Where practicable, heavier objects should be stored around waist height, with space above or below this level being used for lighter or more easily-handled items.

Where lifting of loads from floor level is unavoidable, the risk of injury can be substantially reduced if the load is held close to the body to allow the stronger leg muscles to be used in lifting.

Factors that may prevent this being achieved are the size of the load, obstacles on the floor, lifting from within deep bins or poor stance. Elimination of these problems will allow the task to be carried out more easily.

Team lifting may be necessary to place heavier items into their storage location if they have to be lifted from the floor.

If handling beyond the box zone is necessary, or there is significant twisting to the side, some reduction in the load is recommended.

Lifting loads from the floor when seated should be avoided. The risk of a chair moving while handling should be considered and for this reason the use of a castor chair is not recommended for work involving manual handling, particularly on hard floors. Swivel chairs can be beneficial as they avoid the need for twisting during handling.

2.17 Long Carrying Distances.

If a load has to be carried more than about 10 metres, the effort involved in carrying the load is likely to predominate over that of lifting it and will often be the limiting factor in deciding whether the load should reasonably be handled manually.

Use of transport aids such as trolleys or barrows should be considered. Such aids add signicantly to the efficency of the job as well as to its safety.

Ideally, the height of the trolley should be the same as that of any work surfaces from which the load is moved.

2.18 Strenuous Pushing or Pulling.

Pushing or pulling can place the handler at risk of injury, particularly if it is carried out with the hands below knuckle height, above shoulder height or if the action is jerky.

The condition of the floor and the type of shoes worn by the handler should also be considered, as the risk of slipping can be significant. Floors that are wet, greasy or which have a loose or uneven surface increase the risks.

To get a load moving when pushing or pulling it, a reasonable force to apply is up 25kg(250N). After it is moving, a force of up to 10kg(100N) is reasonable to keep it in motion.

These are not maximum limits but are guidelines to enable the majority of people to carry out the task with minimal risk of injury.

The forces involved in pushing and pulling can be measured with a spring balance if necessary.

2.19 Unpredictable Movement of Loads.

If there is a risk of a load suddenly becoming free (such as when pulling an object that is stuck to release it) or moving unpredictably during handling, the handler is at greater risk of injury.

This risk is increased if the handler's posture is unsuitable.

2.20 - Repetitive Handling.

Frequent or prolonged physical effort can give rise to injury, even if the load itself is not particularly heavy.

Often, repetitive movements are combined with twisting or stooping which increases the risk still further.

Work that involves these factors should be examined very carefully for ways in which the risks can be reduced.

Where the lifting operation is repeated more than about 30 times per hour, or if the load has to be supported for any length of time, the guide figures should be reduced.

2.21 - Insufficient Rest or Recovery Period.

This factor is particularly relevant when repetitive lifting is carried out.

The development of physical and mental fatigue reduces the individual capabilities of a handler over time, and consequently increases the risk of injury.

Regular short halts in the work are a better means of avoiding fatigue than infrequent longer breaks and, where possible, a flexible approach to timing of work breaks should be adopted.

Provided the tasks involved are sufficiently different in character, job rotation can also be effective in avoiding the onset of fatigue as a result of prolonged use of a particular group of muscles.

2.22 Work Rate Imposed by the Process.

This factor is related to the former point. An excessively high and continuous work rate, e.g. loading a fast moving conveyor may result in an individual being unable to take even a few seconds' break from the work. Such a pause in the work, taken at the discretion of the handler, may be all that is necessary to prevent the onset of fatigue.

Tasks that involve the need to maintain a fixed posture for long periods should be avoided.

2.23 Team Handling.

Where an object is too large or heavy to be handled by one person, safe handling may perhaps be accomplished by two or more people working together.

This, in itself, introduces problems, and it is essential that the task is discussed between the team members before attempting the operation.

The way that the weight borne by an individual team member may vary during the task (e.g. when negotiating stairs) should also be considered.

It is important that the operation is effectively co-ordinated so that team members work in unison and do not hinder one another. To achieve this, one person should be nominated to direct the work.

The approximate lifting capability of a two person team can be taken as two-thirds their combined individual capacities. For a three-person team, half of their combined capacity is considered a reasonable figure to adopt.

Question 5.

Manual handling fatigue is best avoided by.....	
Multiple Choice (HP)	
Answer 1:	Regular short breaks
Response 1:	
Jump 1:	Next page
Answer 2:	Infrequent long breaks
Response 2:	
Jump 2:	This page

2.24 The Load.

The risk is increased in any manual handling operation if the load has any of the following properties:

Are They Heavy?

The weight of the load is only one of many factors that have to be considered in making a valid assessment.

Guidelines on the weights that can safely be lifted and lowered by 95% of men are set out in Figure 1(see section 1.19.6). These figures should be reduced by about a third for women.

Note that the safe limits are reduced when work is done either at arms' length or at high or low level. If an object is being moved through more than one box zone, the lowest weight should be taken as the safe limit.

The figures given are not maximum limits, and may be exceeded where assessment of the operation suggests that it is safe to do so.

Any operations where loads exceed the limits by more than a factor of two should come under very close scrutiny, even when carried out by fit, well-trained individuals. Evidence that an assessment of such operations has been made must be available.

Where the weight of a load is identified as presenting a significant risk of injury during handling, consideration should be given to the use of mechanical assistance, or breaking the load down into smaller packages if this is possible.

Sometimes, it may be possible to order materials in a smaller container size.

The effect that such action may have on the frequency of handling should be considered.

Sometimes an increase in the number of individual handling operations may outweigh the benefits of a lighter load.

2.25 Are They Bulky/Unwieldy?

If a load is awkward to handle, there is an increased risk of dropping it and often a problem in adopting the most favourable posture for handling of the load.

Safer handling may be achieved by breaking the load down into more manageable parts or perhaps by ordering or packaging it in a different form.

2.26 Are They Difficult to Grasp?

Loads may be difficult to grasp because, for example, they are wet, slippery or rounded.

Efforts should be made to eliminate these problems at source if possible.

The use of suitable gloves or handling aids (e.g. hooks, clamping devices, handles etc.) or placing the load in a container or sling may help to alleviate the problem.

2.27 Are They Unpredictable/Unstable?

Sometimes a load may be unstable because it is not rigid, or because the contents are liable to move and alter the centre of gravity.

Such additional difficulties are likely to have an effect on the weight of the load that may safely be handled.

This type of risk can be minimised by effective packaging of objects that are liable to shift during handling.

The use of slings can also be helpful for such packages. Where containers hold liquids, the amount of free space should be minimised.

Handling animals or people poses particular problems in this respect and introduces problems that may not exist when handling an inanimate object.

The use of specialised handling aids, combined with effective training is recommended.

2.28 Are They Intrinsically Harmful?

The load may have characteristics that make it intrinsically harmful. This could include sharp edges, rough, hot or cold surfaces.

These characteristics may discourage proper grip and safe handling techniques and make injury more likely.

Sharp edges should be avoided by effective packaging of objects, where possible. If this is not possible, protective gloves should be worn.

If hot or cold objects cannot be allowed to reach a reasonable temperature before handling, then placing them in an insulated container may be a solution. Using personal protective equipment, e.g. gloves, may be necessary.

2.29 The Working Environment.

The risk is increased in any manual handling operation if the working environment is in any way hostile or imposes constraints.

For example:

Are There Constraints on Posture?
This may include restricted head room and other obstructions that hinder an efficient working posture.

Furniture, narrow gangways or other obstructions can all make handling of loads, without excessive bending or twisting, more difficult. A good standard of housekeeping helps to limit the risks.

When planning an operation, ensure that the immediate working space and the route to be used during movement of the load are clear.

Are There Poor Floor Surfaces?
As well as increasing the risk of slipping while pushing or pulling, uneven floors will also increase the risk of tripping, and associated risk of injury. Torn or damaged floor coverings can produce similar risks.

Outdoors, the ground surface should be kept even and firm where routine handling of loads is carried out.

Spillages of water, oil, soap, food scraps or other material should be cleared up immediately.

Are There Variations in Level?
It is often not possible to avoid the movement of materials between different levels within a building but, where possible, the need for such handling should be minimised.

Carrying materials up or down steps can increase the risk of injury. Handling of loads on a ladder is particularly hazardous, since the need to maintain a good hold on the ladder may impair proper grip of the load.

Where heavy or difficult loads must be moved between different levels and a goods lift is not available, team lifting may be necessary. Use of handling aids such as stair climbing trolleys should also be considered. Where it is possible to slide a load rather than lifting it, this may help to reduce the risk of injury.

Are Conditions Hot/Cold/Humid?
Working in extreme environmental conditions can increase the risk of injury through rapid fatigue, loss of manual dexterity and impairment of grip through perspiration on the hands.

Where possible, comfortable working environments should be maintained. The presence of snow or ice should also be taken into account.

Are There Strong Air Movements In The Area?
Sudden gusts of wind can make large loads difficult to handle safely, particularly if they are light in weight, such as large sheets of plywood etc. Where work is performed out of doors, consideration should be given to discontinuing work if weather conditions become unsuitable.

The use of handling aids or team handling may help to reduce the risks.

Is The Area Poorly Lit?
Poor lighting can increase the risks of tripping and bumping against unseen obstructions. Poor posture

may need to be adopted when lifting, as an individual tries to guard against these perceived dangers. A good standard of lighting will help handlers to accurately judge distance and position and to assess the load properly.

Question 6.	
Manual handling risks are increased by environmental constraints.	
True/False (HP)	
Answer 1:	True
Response 1:	
Jump 1:	Next page
Answer 2:	False
Response 2:	
Jump 2:	This page

2.30 Individual Capability.

The individual capability of the person carrying out the manual handling task must also be taken into consideration.

For example:

Is Unusual Capability Required?
Most manual handling injuries arise as a result of the characteristics of the task, rather than because of any major differences in individual capability. Therefore, although individual differences do exist and should be considered as part of the assessment, care should be taken not to place undue importance on this factor.

There is a wide variation in the lifting strengths of both men and women. Although, on average, men are able to safely lift more than women, there is considerable overlap; some women may be capable of safely lifting more than some men.

The nature of the job normally carried out by the employee should also be considered. A job that is routine for a worker involved in heavy physical work may not be reasonable for an office worker unused to that type of activity. It is reasonable to take into account the element of self-selection that tends to occur in jobs involving heavy manual work.

Is The Task A Particular Hazard To Those With A Health Problem?
We need to be aware that a particular individual may have a health problem which could put them at particular risk when carrying out manual handling work. This should be taken into account in the risk assessment. Such problems would include obvious conditions such as back trouble and heart conditions in addition to others that may not be so obviously related.

Is The Task A Particular Hazard To Those Who Are Pregnant?
Although light exercise can be beneficial, some manual handling work, particularly heavy lifting, carries a high risk for women who are pregnant. The risks are normally considered higher in the later stages of pregnancy, when heavy lifting should be avoided. Care should also be taken in the three months after the birth.

Age should also be taken into account. Physical capability for safe lifting generally reaches a peak in the early 20s, declining gradually during the 40s and more markedly thereafter. This may be compensated for, to some extent, by greater experience and maturity in older employees. It is generally accepted, that the risk of injury during manual handling is greater for those in their teens and in their 50s and 60s than for those in their mid years.

Clothing.
Consideration should be given to the suitability of clothing or personal protective equipment being worn by the person carrying out the manual handling task. Relevant aspects may include:

Is The Clothing Suitable?
Routine/repetitive manual handling may require special clothing. In general, flat shoes with non-slip soles should be worn. Clothing should be loose enough to allow free movement but have no parts which might snag on the load.

Is Personal Protective Equipment Required?
Additional personal clothing needed in cold conditions, or protective equipment worn to guard against other hazards may restrict movement and reduce individual capacity to handle a particular load safely. This should be taken into account when making an assessment of a manual handling task. The effectiveness of PPE must not be compromised to make the manual handling work easier.

2.31 Suggested Measures to Prevent/Reduce Injury.

Suggested measures to prevent/reduce injury can easily be remembered by using the **TILE** acronym:

TILE stands for **T**ask, **I**ndividual capability, **L**oad & **E**nvironment.

The Task.

1. Redesign workplace layout.
2. Load to be placed in front of handler as close as possible.
3. Handler to be able to walk around or rotate object.
4. Increase the workspace so feet and whole body can turn. If seated, give swivel chairs.
5. Raise working surface or provide adjustable height tables, re-design storage facilities/work place layout.
6. Lower storage level, raise working height of handler.
7. Provide mechanical aids e.g. trolleys or mid-point rest tables. Relocate work areas (make closer).
8. Provide mechanical aids, slides/chutes/rollers/trolleys, reduce size/weight of load, increase weight/size of load to force use of mechanical aid.
9. Provide adequate rest periods.
10. Vary tasks.
11. Specify team lift.

The Individual.

1. Health, pregnancy.
2. Age, Strength, capacity.
3. Training on safe systems of work, manual handling.

The Load.

1. Reduce weight (or increase it excessively to force use of mechanical aids).
2. Provide handles.
3. Modify load.
4. Reduce size.
5. Pack contents so no shifting likely.
6. Prevent release of hazardous substances, e.g. dust

The Working Environment.

1. Re-design workplace layout.
2. Modify floor surface.
3. Ensure adequate lighting.
4. Consider weather conditions, e.g. wind, rain.
5. Ensure good housekeeping.

Also consider:

Work Organisation.

1. Re-design task to take account of personal protective equipment.
2. Train staff to team lift.
3. Ensure staff are available.
4. Plan the job.
5. Train staff to assess situations.

2.32 Summary of Possible Controls.

1. Modify load.
2. Modify workplace/layout.
3. Ensure hazard-free environment, - lighting, floor conditions, etc.
4. Rearrange materials flow.
5. Use different actions/movements.
6. Provide mechanical assistance.
7. Organise team lifting.
8. Identify vulnerable persons.
9. Train handlers to weigh up the job and adopt kinetic lift techniques.

2.33 General Guidelines.

It is very unlikely that there is such a thing as a completely safe manual handling operation.

People, even fit strong people, strain their backs while putting their socks on or while getting in or out of

the bath.

Following the HSE guidelines will reduce the risks of manual handling operations; see below.

2.34 General Guidelines on Safe Manual Handling of Loads.

Examine the object.
Assess its weight and shape and note any sharp edges. Is the load stable and evenly distributed? How about doors, especially self-closing doors?

Plan the job.
Ensure that there is a clear, safe route to where the object is to be set down, incorporating suitable 'rest stops' if required. If necessary, get someone to help you. Would a mechanical aid such as a trolley be useful?

Is your clothing suitable?
Routine/repetitive manual handling may require specialist clothing. In general, shoes should be flat with non-slip soles, clothes should be loose enough to allow free movement with no parts (buttons, flaps) likely to snag on the load. Gloves may be necessary if the object has sharp or rough edges.

2.35 Safe Lifting Techniques.

Training workers in manual handling techniques.
Assuming that manual handling cannot be avoided, it is clearly important that workers should receive appropriate training.

The risk to workers may be increased if they are unaware of basic information about the load (e.g. a possible risk of instability, abnormal centre of gravity), or if they do not understand the basic principles of safe manual handling techniques.

All staff should be aware of the following points:

- How to recognise potentially hazardous handling operations.
- How to deal with unfamiliar handling operations.
- The proper use of any handling aids provided.
- The proper use of personal protective equipment.
- The importance of good housekeeping.
- Features of the working environment that contribute to safety.
- Factors affecting individual capability.
- Good handling technique.

Where frequent heavy or specialised (e.g. team) lifting is routinely carried out, it is recommended that those involved in the work are provided with specialised training.

2.36 Lifting.

- Stand close to the load facing the direction in which you intend to travel, with your feet spread to create a firm base.

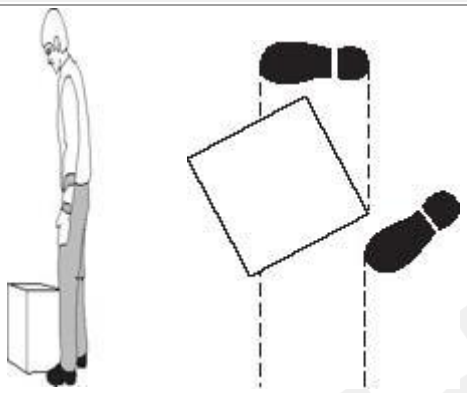


Figure 1.

- Bend your knees and keep your back in a natural line. Don't bend your knees fully as this will leave little power to lift.
- Grasp the load firmly. The best grip is one in which the fingers are curled into a hook.
- Raise your head.
- Lift with your legs. Use your leverage, momentum, balance and timing for a smooth action. Move your feet as necessary.

Figure 2.

- Avoid twisting the body during lifting.
- Do not bend sideways.
- Hold the load close to the centre of your body.

2.37 Carrying.

Carrying

- Keep the load close to your body, with your arms and chin tucked in.
- Avoid twisting your body, stooping, bending or leaning back.
- If you need to change direction, move your feet.
- Don't change your grip unless the load is sufficiently supported.
- Don't block your vision with the object you are carrying.

Figure 1. Carrying

2.38 Unloading.

- The same care should be applied as when lifting a load.
- To lower the object, the knees should be bent, with the back kept straight and the weight close to the body.
- If the load is to be placed on a bench or table, rest it on the edge and push it forward with your arms and body. If possible, sliding the load is safer, particularly when it needs to be fitted into tight places.
- Be careful with fingers and toes. Allow enough room for them when the load is set down.

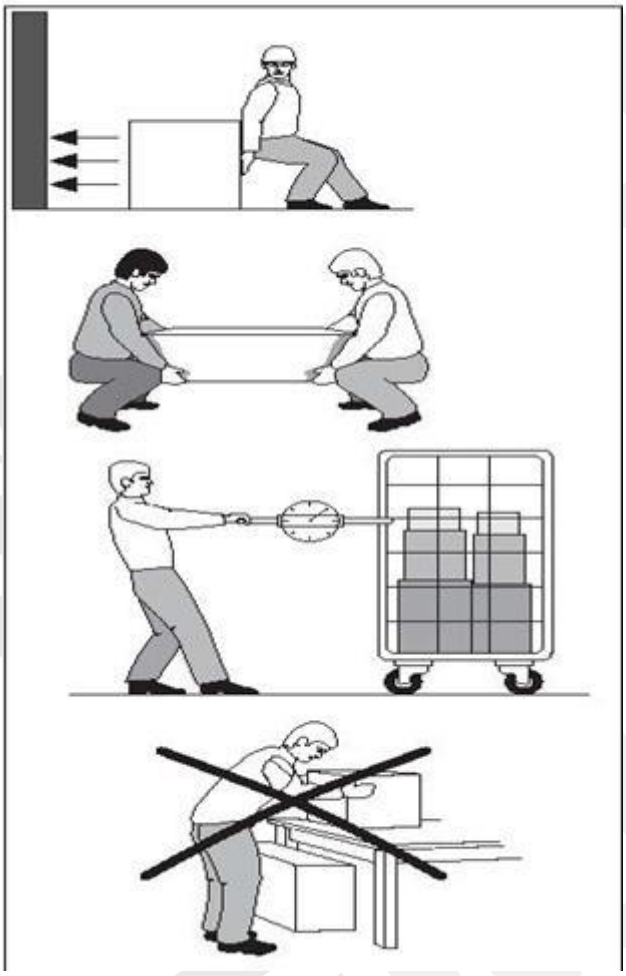


Figure 1. Unloading.

2.39 Holding Loads Away from the Trunk.

When a load is held away from the trunk, the stress on the lower back increases substantially.

As a rough guide, the stress on the lower back is about five times more when a load is held at arm's length than when it is held close to the body.

The friction of a load against the worker's clothing also helps to support and steady the load when it is close to the body.

Any changes that can be made to the task which allow the load to be held closer to the handler's body are likely to be beneficial.

2.40 Twisting & Reaching.

Guidance weights should be reduced by 10% if the work involves a twisting action through 45 degrees or more, or by 20% if a twist through 90 degrees or more is involved.

A seated person should not attempt to lift more than 5 kg.

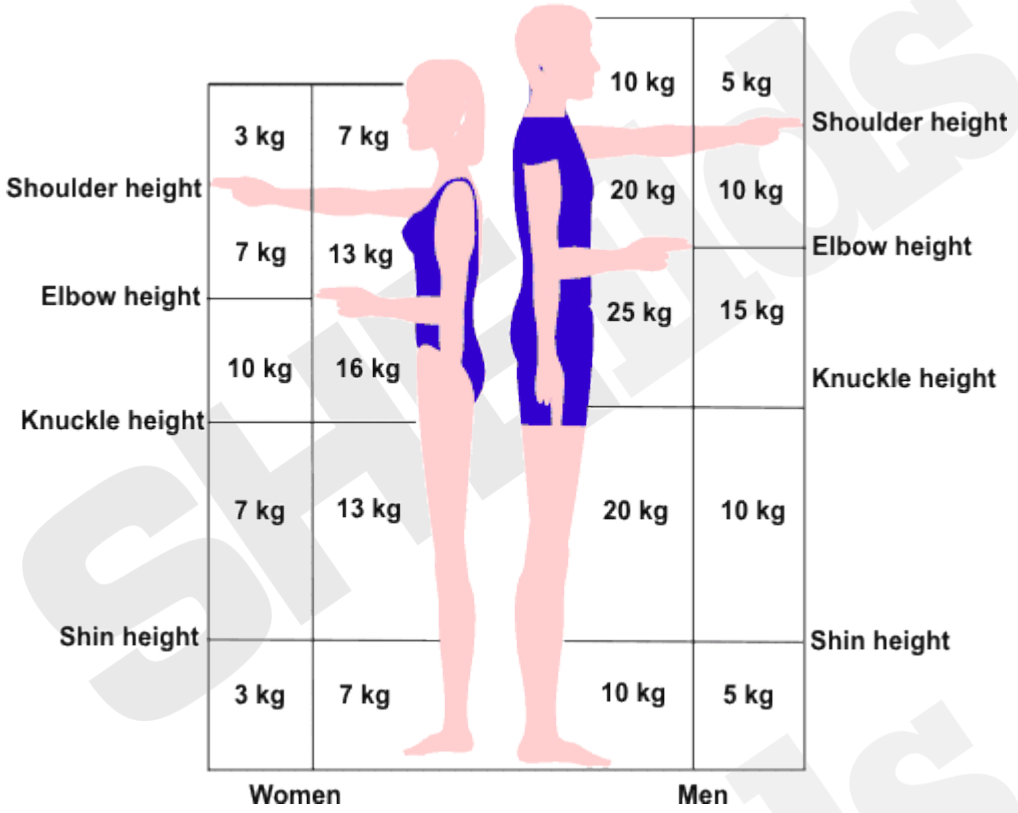


Figure 1.

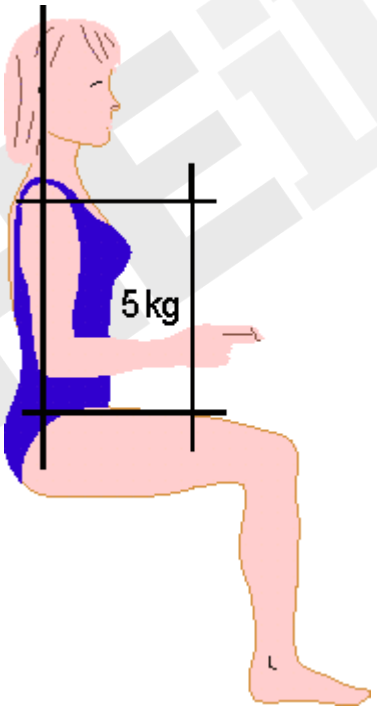


Figure 2.

Twisting.

This increases the load on the lower back whether it is done by bending the back, or by leaning forward with the back straight.

In either case, the weight of the trunk is added to the weight of the load being lifted.

Attention should be given to storage of materials to avoid heavy or awkward loads having to be lifted from the ground.

Reaching Upwards.

Greater loads are imposed on the back, shoulders and arms when a load is handled with arms outstretched. As a result, there is a greater risk of injury when handling of a load is carried out while reaching upwards, particularly if the stretching is prolonged or repetitive.

Control of the load is also more difficult when the arms are outstretched.

2.41 UK Statutory Requirements Manual Handling.

The Manual Handling Operations Regulations 1992.

Introduction.
The Manual Handling Operations Regulations 1992 (MHO) came into force in the UK on 1 January 1993 . These highlight the key issues for inspection and enforcement by local authority enforcement officers.

Practical guidance on the regulations is given in the HSE booklet Manual Handling: Guidance on Regulations ISBN 0 11 886335 5. (L23)

General.
These UK regulations seek to reduce the very large incidence of injury and ill-health arising from the manual handling of loads at work.

1 in 4 of all reportable injuries is caused by manual handling. In fact, the number may be even higher than that. These accidents do not include cumulative injuries, particularly to the back, which can lead to physical impairment or even permanent disability.

The MHO Regulations place duties upon employers in respect of their own employees. Identical duties are placed on the self-employed in respect of their own safety.

Interpretation (REG. 2(1)).
The UK MHO Regulations are concerned with risk of injury from a manual handling operation by itself, and not with risks posed by loads which are intrinsically hazardous. They do not apply, for example, to risks of injury from toxic or corrosive substances which might contaminate or leak from loads being handled. Such risks are dealt with elsewhere, e.g. by the COSHH Regulations.

The Regulations extend to the manual handling of people and animals.

The definition of 'Manual Handling Operations':

"Any movement or supporting of a load (including the lifting, putting down, pushing, pulling, carrying or moving thereof) by hand or by bodily force."

Practical examples are given in the HSE guidance on the UK Regulations. Manual handling implies that an attempt is being made to move a load. Therefore, if a girder being moved manually is dropped and fractures an employee's foot, it is a manual handling accident. If the girder is inadvertently knocked over and causes a similar injury, this would not be due to manual handling.

An important exception is that a tool or machine being used for its normal purpose is not a load. Therefore, chainsaws being unloaded from a vehicle would be regarded as a 'load' and subject to the MHO Regulations, but they would not be a 'load' in normal use.

Regulation 4 sets out a hierarchy of 3 control measures:

1. Avoid manual handling operations which involve a risk of injury, so far as is reasonably practicable.
2. Assess all such operations which cannot be avoided (see schedule 1 in the Guidance).
3. Take steps to reduce the risk of injury during those operations to the lowest level reasonably practicable.

These measures do not stand in isolation. They follow on from the more general requirement to carry out a risk assessment required by the Management of Health and Safety at Work Regulations, regulation 3.

If there is no evidence of risk of injury, regulation 4 has no effect and the employer has no duty. Deciding the presence and degree of risk will be a matter of judgement in each case. The HSE guidance on the regulations includes some steps that employers will wish to consider in the light of the assessment, but it is up to employers to choose appropriate measures.

A 'generic' assessment is acceptable if it can legitimately draw together strands common to several operations or employees. For example, the unloading of a variety of materials on building sites and routine delivery to several separate locations might be best covered in a generic assessment.

The guide-lines provided in Appendix 1 of the HSE guidance should help employers determine which operations carry a greater risk of injury and therefore require a more detailed assessment.

Schedule 1 of the UK regulations provides a list of the factors for which the employer must have regard and the questions to be considered, particularly when making a more detailed assessment of manual handling operations. Appendix 2 of the Guidance to the Regulations gives an example of an Assessment Check list which may be used. Clearly, employers can devise their own checklists.

Most employers should be able to carry out their own assessments; if there are particularly complex manual handling operations, it might be necessary to seek outside help, but as a general rule this should not be required.

The employer's assessment might properly conclude that the steps to be taken to reduce the risk of injury should include training which enables employees to deal safely with the range of handling operations they are likely to have to carry out, perhaps without immediate supervision.

Loads will not always need to be marked with their weights; it will often be possible to provide sufficient information in other ways, e.g. through training.

In addition, as with other systems for reducing risk, we need to review.

2.42 The Key Requirements for the Employer.

We are going to make use of another acronym now, but before we do we would like to ask you a question:

What is the first thing you are likely to say if you pulled your back at work?

No profanities please!

2.43 AARR !!.

You may/may not have said this or something similar.

The key requirements for the employer are:

Avoid.

Assess.

Reduce.

Review.

2.44 Supplement for this unit:- Case Studies of Possible Manual Handling Solutions.

Supplement for this unit: Case Studies of Possible Manual Handling Solutions.

The task.	The solution.
Repeatedly lifting full buckets of water from a sink.	Put a length of hosepipe on a tap and fill buckets on the floor.
Lifting 25 kg sacks from the filling point to a weighing machine on the floor and then onto a 1m conveyor.	Raise the weighing machine so that it is in line with the conveyor.
Elderly patients falling out of bed in a nursing home.	Fit guards to the beds of those patients at risk this means carers do not have to lift patients back into bed and reduced the risk of injury for the patient.
Reduce the number of accidents at a local authority depot where building materials are handled.	Arrange for the materials to be delivered direct from the builder's merchants to the work sites.
A large heavy pourer is used to pour the Plaster of Paris into the mould.	Use a small watering can instead that is continually refilled by a hose running into the watering can from a large supply tank with gravity playing its part.

It is necessary to move a round, glass, gallon container of mildly toxic liquid.	Put it into a box and pack well with light packing material.
Reduce the amount of dry goods wasted when moving sacks from one location to another.	Fold the upper edge several times to form a surface that is easier to grip.
Moving computer monitors.	Position the handles or hand grips on the heaviest side to enable you to carry the bulk of the weight close to your body. Use a trolley.
Move a heavy toolbox around a workshop.	Put it on wheels and add a handle, or use a trolley designed for the purpose.
Reduce the number of accidents the cleaners have with buckets of hot water in a large office block.	Put castors on the base of the bucket, then the cleaners can push the bucket rather than lift it.
Protect your hands from sharp or rough surfaces.	Wear gloves; use rope to make carrying boards or other slim objects easier.
Avoid heavy or unstable loads in cages.	Have guidelines perhaps not to add a load to a roll cage if its bottom surface is above a specified horizontal bar on the cage.
Lifting at arm's length is likely to be more strenuous than lifting close to the body. Where an obstruction prevents you from approaching the load you can often rearrange the workplace so you can get as close as possible.	For example: steel separator trays had to be put into a fixture from transfer into a steam cooker. Operatives could not adopt good postures while loading the fixture because a metal barrier, provided for safety reasons, was blocking their way. By providing an access gate, with suitable safety interlocks, the distance between the operatives and the fixture was substantially reduced.
People of different sizes use the same workstation, for example a loading station on an assembly line.	You could provide a platform to raise the smaller person to avoid lifts above shoulder height. It needs to be positioned so that it is not a tripping hazard, and must be large enough so there is no risk of the person falling off.
Reduce large vertical movements.	Can the item be stored on or near to ground level? Use a trolley or some other intermediate device so the lift is not so great.
Reduce twisting.	Organise the workplace so that lifting can be carried out in a straight line.
Reduce stooping i.e. into a cart used for transporting materials.	You could use removable side to reduce the reaching and lifting action.
Reduce the physical stress of pushing and pulling.	This is easier if carried out at waist height and also if the force is exerted towards and away from the body rather than sideways.

2.45 Video: Manual Handling.

Question 7.

Manual handling assessments need only be concerned with heavy loads as light loads never cause problems.	
True/False (HP)	
Answer 1:	False
Response 1:	
Jump 1:	Next page
Answer 2:	True
Response 2:	
Jump 2:	This page

Question 8.	
the lower back is known as the _____ region	
Multiple Choice (HP)	
Answer 1:	lumbar
Response 1:	
Jump 1:	Next page
Answer 2:	Thoracic
Response 2:	
Jump 2:	This page
Answer 3:	Cervical
Response 3:	
Jump 3:	This page

3.0 Manually Operated Load Handling Equipment

The following sections will cover different types of manually operated load handling equipment, in particular:

- Sack trucks.
- Pallet trucks.

- People handling hoists.
- People handling aids.

3.1 - Sack Truck.

The flat tip of the sack truck slides underneath the load and then the handles are pulled back towards the user to lift the load. The sack truck is then manually pushed to its desired location.

Figure 1. Sack Truck.

Hazards with sack truck use:

- Ergonomic hazards associated with posture and over exertion
- Tripping or falling when pushing the truck
- Manual handling injuries associated with pushing and pulling the truck

Controls:

- Ensure the safe working load in not exceeded
- Guidance and instructions for the operator
- Ensure the capabilities of the user are not exceeded
- Risk assessment for use of the equipment

3.2 Pallet Truck.

The pallet truck contains two forks which are inserted underneath the pallets. The forks are then lifted and the load lifted off the ground and then moved to the new desired location.

Figure 1. Pallet Truck.

Pallet trucks can be powered or non-powered.

Hazards associated with pallet truck use:

- Loads can crush the user.
- The pallet truck momentum can also crush others.
- Trip over the forks of the equipment.
- Manual handling strain injuries.
- If battery powered then there may be hazards associated with charging or battery power points.

Controls for use include:

- Training operatives in their use.
- Only allowing trained operatives to use the equipment.
- Not exceeding safe working loads.
- Regular inspection and maintenance of the pallet trucks.
- Designated parking areas.

3.3 People Handling Hoists.

These types of hoists are used in hospitals and care homes in order to ensure the safe lifting of patients/people from for example chairs to beds.

Figure 1. People handling hoists.

These types of hoists can be either manual of a mix of manual and electronic systems.

Two examples of hoists can be seen to the right, a mobile hoist and a ceiling hoist.

Hazards of use include:

- Manual handling risks from the effort needed to move the device and person.
- Trips when pushing/pulling the hoist
- Collision especially when transporting around corners
- Uncontrolled movement should the wheels not be locked.
- Crush to the toes or feet
- Loss of power during movement
- Charging area points

Controls for use:

- Inspect route to be taken to ensure they are clear of obstruction
- Lock wheels when lifting lowering the person
- Non sip footwear for the operators with toe protection
- Check battery's before use
- Stored safely out of the way when not in use to prevent damage
- Used only be trained staff
- Check loads to ensure the safe working load is not exceeded
- Regular maintenance and inspections

3.4 People Handling Aids.

The hazards associated with this group of aids include:

- Repetitive task causing strains.
- Changes in height.
- Obstacles in the way.

Controls for these include the use of:

- Slide sheets and walk belts.

Slide Sheet.

This device allows the movement of the person without actually having to lift them therefore reducing the amount of effort needed and therefore reducing the likelihood of sprains and strains. As the patient is not actually lifted then they will not suffer friction and bruising form the lifter.

Walk Belt.

The hazards associated with the walk belt include:

- Effort required by the carer/nurse as they still have to support the patients weight.
- The belt can ride up and cause discomfort to the wearer which can increase instability.

The controls for the walk belt include:

- Ensure at least two carers/nurses are their to assist the individual.
- Fit the belt properly.
- Check fastenings before use and after being fitted to the individual.

4.0 Mechanically Operated Load Handling Equipment.

There are four elements to mechanical handling.

All of these can present hazards:

- The load.
- The workplace.
- The handling equipment.
- The employees involved.

The load must be prepared so as to minimise the possibility of accidents occurring. Consideration should be given to the type of load being transported. Is it flammable? Is it balanced properly?

Wherever possible, the workplace should be designed so that people and loads are kept apart. For example, if a crane is being operated then the immediate vicinity should be cordoned off, so that workers or others cannot come into contact with the load or equipment.

The equipment must be able to lift or move the load concerned. It is vital that the equipment is inspected regularly and well-maintained.

The type of hazards associated with this type of equipment are collisions between people and equipment, and people becoming trapped in moving parts of the equipment.

The employees involved in the use of such equipment must be competent and properly trained and supervised in its use.

4.1 Conveyors & Elevators.

Conveyors transport loads along a level, whereas elevators move loads from one level to another.

There are three forms of conveyor:

- Belt.
- Roller.
- Screw conveyors.

Figure 1. Roller Conveyor

Pictured is a roller conveyor. Used for the movement of unit loads. Gravity or powered types.

Types of hazards associated with this equipment are:

- Nips - where a hand is trapped between rotating rollers and the belt.
- Entanglement - where loose clothing gets caught up in the power drive.
- Loads falling from the conveyor.
- Noise and vibration hazards.
- Manual handling hazards.
- Impact from overhead systems.
- Sharp edges.

All of the above can be avoided by appropriate control measures i.e. guards and edge protectors, restricted access and warning signs to name but a few.

Emergency trip wire or stop buttons should be fitted and operational at all times.
Elevators are used to transport goods between different levels and guards should be fitted at each end of the elevator and around the power drive.

4.2 Fork Lift Trucks.

This is the most common form of mobile handing equipment. It comes from the group of vehicles referred to as Lift Trucks and can be used on construction sites, factories, warehouses and farms. The term 'fork lift truck' is applied to the counterbalanced lift trucks, where the load on the forks is counterbalanced by the weight of the vehicle over the rear wheels.

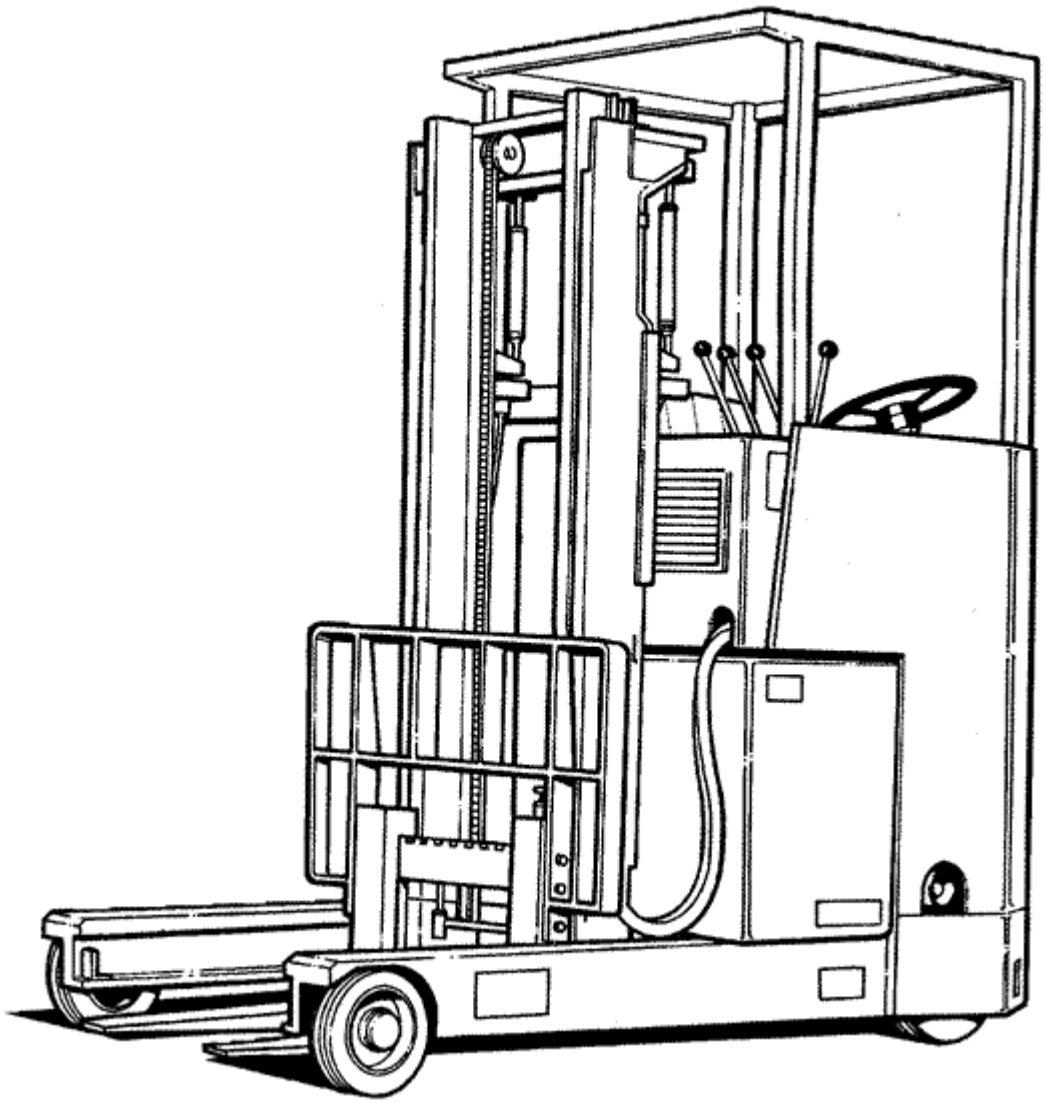


Figure 1. Fork Lift Truck

Industrial Reach Truck.

There are various types of mobile mechanical handling equipment, including:

Pedestrian-operated stacking trucks. These may be manually, or power operated; manually-operated stackers are usually used for moving post pallets or heavy machinery, whilst power-operated stackers can pick up pallets from the floor.

Reach trucks. The load can be retracted within the wheel base, minimising the overall working length.

Counterbalance fork trucks. These may be powered by battery, petrol, diesel or gas; the load is carried in front, counterbalanced by the weight of the vehicle. There are three types; the lightweight pedestrian-controlled truck, lightweight rider-controlled truck, and the heavyweight rider-controlled

truck.

Narrow-aisle trucks. These enable aisle width to be kept to a minimum as the base of the truck does not turn within the aisle to load/unload. There are two types; the side loader, and the counterbalance rotating load turret truck. These vehicles are often guided by rails on the floor.

Order pickers. These devices comprise a protected working platform fixed to the lift fork, and as they can operate in very narrow aisles, they utilise racked storage areas efficiently. They may be conventional types, or purpose designed.

4.3 Fork Lift Truck Hazards.

There are many hazards associated with the use of such vehicles, for example:

- Overturning caused by driving too fast or hitting an obstruction, poor vehicle condition, incorrectly balanced load.
- Overloading exceeding the capacity of the vehicle.
- Collisions with people or other equipment such as warehouse racking
- Uneven road/ floor surface.
- Overhead obstructions.
- Poor vision around the load.
- Battery charging - possibility of explosion and fire.
- Fire - use of vehicle in areas where flammable substances or gases are stored, also fuel leaks from poorly-maintained vehicles.

Health hazards include:

- Exhaust fumes.
- Noise.
- Vibration.
- Manual handling.

4.4 Fork Lift Truck Checks.

All lift trucks should be regularly serviced and maintained and this should be documented.

Drivers should check the vehicle before use and should include the following in the check:

- Tyre condition and pressure.
- Batteries fully charged.
- Lifting equipment working correctly.
- Brakes working correctly.
- Horns and audible and visual alarms working correctly.
- Lights working correctly.
- Mirrors clean and properly set.
- Secure and properly-adjusted seat.

An analysis of safe truck operation identifies three principal aspects as the potential cause of truck

accidents: **THE DRIVER**, **THE TRUCK** and **THE SYSTEM OF WORK**

4.5 The Driver.

Drivers should be in good health, with sound vision and hearing. They should be over eighteen years of age and trained within an approved training scheme.

Drivers should observe the following precautions:

- Regulate their speed with visibility and weather conditions if outside.
- Use the horn whenever turning a blind corner.
- Be constantly aware of pedestrians and vehicles on roadways, loading bays, storage areas and transfer points. (the use of convex mirrors located at strategic points greatly reduces the risk of collision).
- Drive in reverse when the load obscures vision.
- Travel with the forks down; and not operate the forks when in motion.
- Use prescribed lanes/routes.
- Stick to factory speed limits.
- Slow down on wet or uneven surfaces.
- Use the handbrake and tilt mechanisms correctly.
- Take care on ramps (max 1:10). The load should always be uphill when going up or down ramps and slopes.
- When leaving the truck at any time, ground the forks, put the controls in the neutral position, switch the power off, apply the brakes, and ensure the key or connector plug is removed.

Drivers should not:

- Carry passengers.
- Park in front of fire appliances or fire exits.
- Turn around on ramps.
- Permit unauthorised use, e.g. by contractors or untrained drivers

4.6 Training.

Aspects of training that should be covered include:

- Health and safety responsibilities.
- Theory of operation of the vehicle.
- Familiarisation with the actual vehicle.
- Practical operating in the working environment.

The Truck.
On no account should vehicles which are in a defective or dangerous condition be used.

4.7 The System of Work.

Loads should always be placed dead centre on the forks. On no account should the maximum rated load capacity be exceeded.

The truck should be driven with forks well under the load, with the load located firmly against the fork carriage and the mast tilted to suit the stability of the load being carried.

The following points should be taken into account:

- The maximum rated load capacity of the equipment should never be exceeded.
- A load which looks unsafe should never be moved.
- Broken, defective or inadequate strength pallets should never be used.
- Care must be taken at overhead openings, pipe-work, ducting, conduits, etc.
- Powered mechanical-handling equipment should only be used/driven by competent/authorised personnel.
- When not in use, rider trucks should have the forks lowered and be immobilised. The controls should be in neutral, the power turned off, the brakes applied and the key or connector plug removed.
- Slinging should be undertaken only at designated slinging points.
- Passengers should never be carried, unless in/on a specially designed cage/platform. This should be a disciplinary offence if breached.
- When driven on public roads, traffic laws must be complied with, and appropriate attachments fitted, such as lights, number plate etc.
- The keys should be securely stored, and only issued to authorised persons. At the end of a shift, the keys should be returned to the person in charge.

4.8 Video: Fork Lift Trucks.

http://www.sheilds-elearning.co.uk/file.php/52/Videos/NGC%20FLT.flv

4.9 General Transport.

The following information is taken from the HSE Report into Works Transport Fatalities.

Types of Accident:

Forward motion.
More than one in three deaths occurred while the vehicle was in forward motion. Traffic discipline, the condition of surface-ways and the selection and driving competence of the driver are all relevant in this context.

The importance of proper selection is therefore strongly emphasised. Great care is needed when selecting personnel with basic ability, temperament and medical fitness. Driving requires skill, care and application.

Reversing.
Nearly one in four deaths occurred during reversing, of which the majority arose from management defects, unsafe systems of work and inadequate training, instruction and information.

Overturning.
One in ten arose from overturning.

4.10 Cranes.

Cranes may be either a jib crane or an overhead gantry travelling crane.

Overhead cranes are mainly used in factories, warehouses and workshops.

Mobile cranes are ones that can move from place to place under their own power; truck mounted, crawler mounted, the term also covers portable cranes towed.

Tracked - Rail mounted docks, certain types of tower cranes.

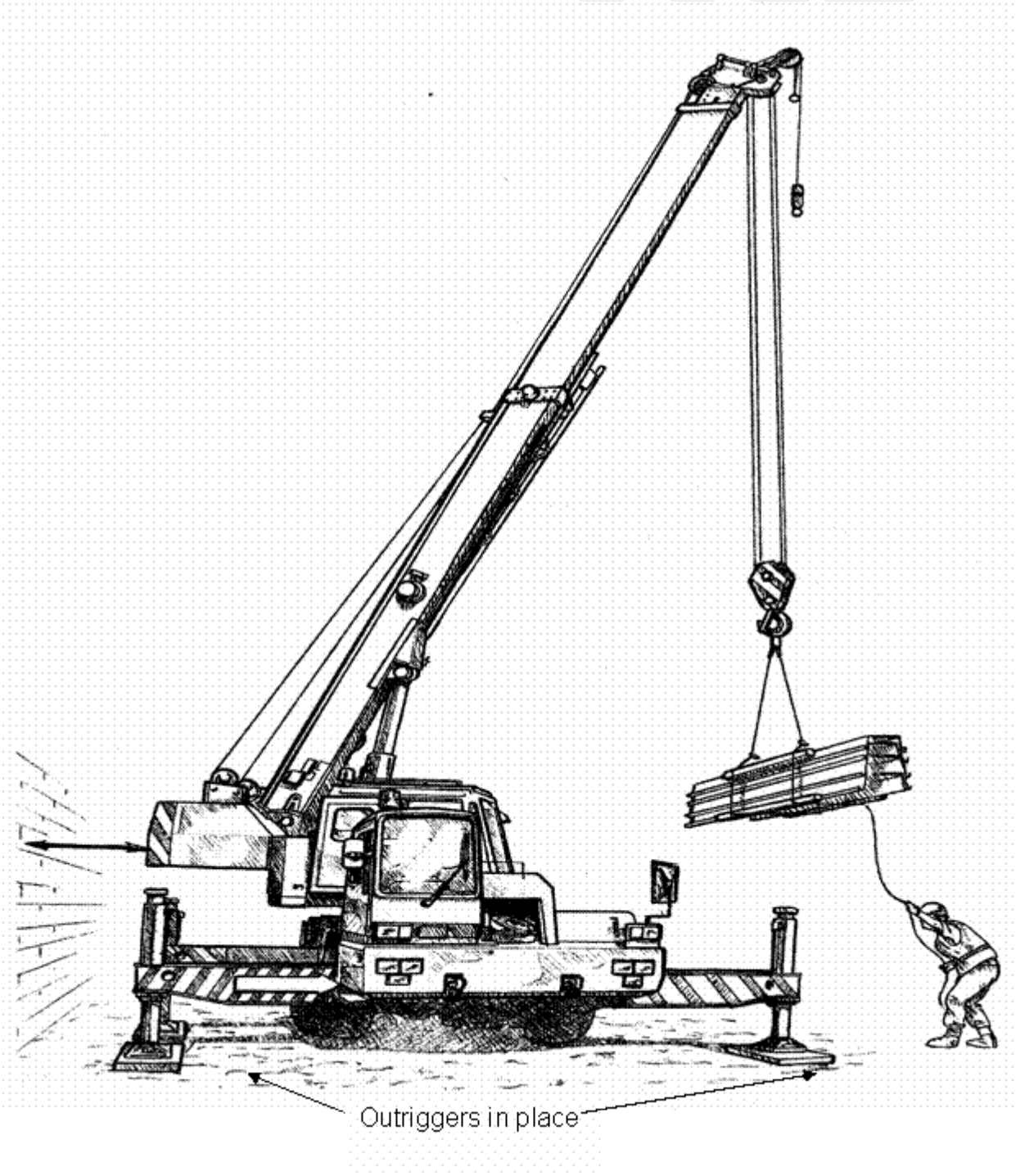


Figure 1. Crane with Outriggers in Place.

Common Causes of Accidents Involving Cranes.

Over 70% of accidents involving cranes occur when a load is being slung or moved.

The main causes are as follows:

- Crushing between the load and another object or between the sling and the load or the sling and the hook.
- Swinging load.
- Load fouling another object.
- Struck by descending load.
- Struck by falling load.
- Other causes:
- Crane overturning.
- Jib breaking or falling.
- Being trapped in the crane mechanism.
- Rope, chain or sling failure.
- Falling from crane.

4.11 Cranes Continued.

When using a crane, the driver should consider the following points to ensure safe operation:

- Safety inspection of crane should be undertaken before use.
- Ensure good visibility and communications.
- Make sure no-one in the vicinity can be struck by the crane.
- Never carry loads over people.
- Always lift vertically; loads should never be dragged.
- Travel with the load as close to the ground as possible.
- Power should be switched off when the crane is not in operation or when it is unattended.
- If outriggers are fitted, these should be used.
- Audible and visual alarms are working.
- Weather conditions need to be considered and tag lines should be used in windy conditions.

4.12 Slings.

When using slings, the following points should be considered:

- Identify the weight to be lifted.
- Check the safe working load marked on the sling; do not use it for any load in excess.
- Examine all slings before use; reject any that are found to be defective, i.e.
    - Kinked;
    - With a protruding core;
    - Excessive number of wires broken;
    - Excessive rusting.

- Lower loads onto adequate battens to prevent damage to the slings.
- Use protection on sharp corners of loads.
- Slings must never be shortened by tying knots in them, or by wrapping round the crane hook.

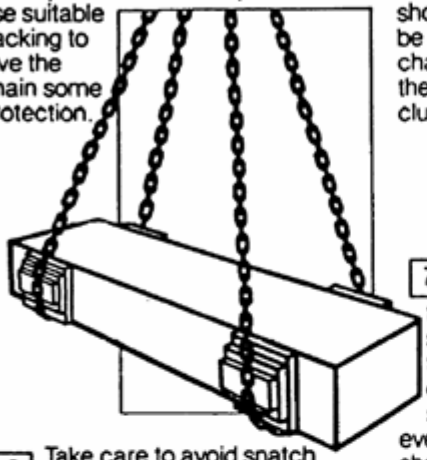
Do not use hemp or wire rope slings for hot loads and keep them away from welding or flame-cutting

operations.

4.13 Good Slinging Practice.

GOOD SLINGING PRACTICE

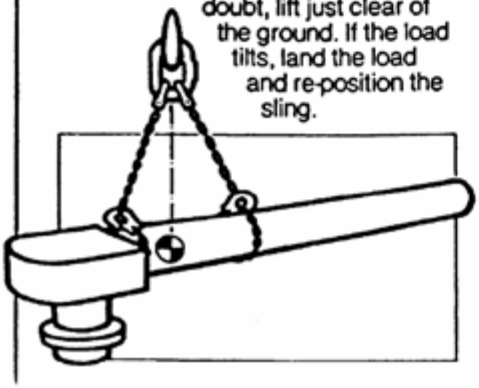
1 Chain is designed to support a load in a straight line. Never tie knots in chain. Always make sure a chain is free from twists before putting it under tension. Where chain has to pass round a sharp corner, use suitable packing to give the chain some protection.



2 Take care to avoid snatch or shock loads which can easily overstress a chain.

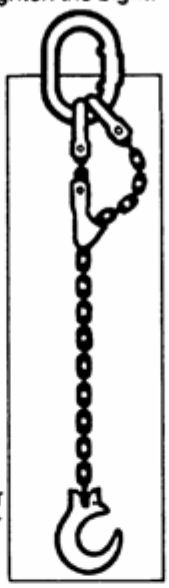
3 Never load a hook on its tip or wedge a hook into a lifting point. The load should always sit comfortably in the hook bowl.

4 To ensure a level lift the crane hook should be vertically above the centre of gravity of the load. If in doubt, lift just clear of the ground. If the load tilts, land the load and re-position the sling.



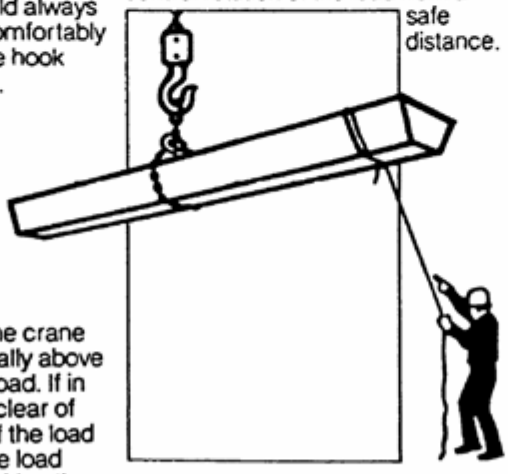
5 Never hammer a sling in order to re-position it, or in the case of choke hitches, to tighten the bight.

6 If the sling is fitted with shortening clutches, be sure the loaded chain passes out of the bottom of the clutch as illustrated.



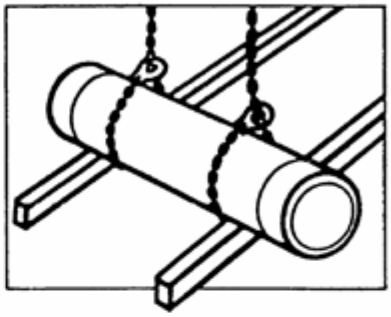
7 Before starting to lift a load, the slinger should stand well clear so that he is in no danger if the load shifts in the sling or even falls. The slinger should wear suitable protective clothing.

8 If the load is long, a rope of ample length should be tied to one end so that the slinger can control rotation of the load from a safe distance.

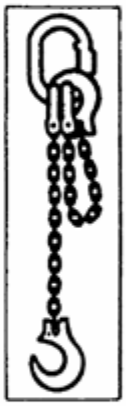


9 In the case of Single-leg slings in basket hitch, the load should be of such a shape that the sling can be passed through it as illustrated on Page 12. Alternatively single-leg slings may be used in basket hitch in pairs from a lifting beam. Double-leg slings should only be used in basket hitch if the load is of such a shape as will prevent the two loops of chain sliding together.

10 Always have a prepared landing site ready to receive the load. Never lower the load on to the chain. If necessary, use timber battens to rest the load on so that the chain may be easily pulled from under the load.



11 In the case of multi-leg slings, if not all legs are in use, the unused leg should be hooked back into the top link. Similarly after a lift is completed, all hooks should be engaged in the top link out of harm's way.



12 When lifting operations are finished, slings should be stowed on a purpose-made rack where they will be safe from damage.

13 Slingers and crane drivers should use the Code of Signals given in British Standard 5744:1979.

14 Slingers and crane drivers should be properly trained in the use of lifting equipment. The training courses organised by the Chain Testers' Association of Great Britain are recommended as is the 'Code of Practice for the Safe Use of Lifting Equipment' published by the same organisation.

Question 9.	
What percentage of crane accidents occur when the load is being slung or moved?	
Multiple Choice	
Answer 1:	Over 70%
Response 1:	
Jump 1:	Next page
Answer 2:	Over 85%
Response 2:	
Jump 2:	This page
Answer 3:	Over 50%
Response 3:	
Jump 3:	This page

Question 10.	
Safe operation of a crane should include...	
Multiple Choice (HP)	
Answer 1:	All of the above
Response 1:	
Jump 1:	Next page
Answer 2:	Switching off when not in operation or when unattended
Response 2:	
Jump 2:	This page
Answer 3:	Good visibility
Response 3:	
Jump 3:	This page
Answer 4:	Safety inspections before use

Response 4:	
Jump 4:	This page

4.14 Lifting Equipment Statutory Examinations.

Two terms are used in specifying examinations:

1. Inspection.
2. Thorough examination.

The inspection is to identify whether the equipment can be operated, adjusted and maintained safely in order that any damage or defect can be detected at the earliest opportunity.

A thorough examination may include a visual inspection and testing of parts and components under operating conditions.

This examination is usually carried out by an independent competent person and a written report is submitted to the employer, stating the findings.

A thorough examination of the lifting equipment should be undertaken as follows:

- Every six months if the equipment is used for lifting people.
- Every twelve months for all other lifting equipment.
- Before the equipment is used for the first time.
- After it has been moved and reassembled at a new location.
- As directed by a competent person if a specific examination schedule has been drawn up.
- Where exceptional or unusual circumstances arise, such as severe weather conditions.

The competent person undertaking the inspection should notify the employer immediately of any defect and, as soon as is practicable (within 28 days), write a full report to the employer.

The initial report should be kept for the life of the lifting equipment. For all other examinations, a copy of the report should be kept until the subsequent examination and report has been produced and for a minimum of two years.

If any defects are found, then the appropriate enforcing authority should be informed by the person carrying out the examination.

The equipment should be inspected regularly, and at suitable intervals between statutory examinations.

Question 11.

A thorough examination of the lifting equipment should be undertaken every _____ months if the equipment is used for lifting people.

Multiple Choice (HP)

Answer 1:	six
Response 1:	

Jump 1:	Next page
Answer 2:	one
Response 2:	
Jump 2:	This page
Answer 3:	two
Response 3:	
Jump 3:	This page
Answer 4:	three
Response 4:	
Jump 4:	This page

Question 12.	
Hemp or wire rope slings must not be used for hot loads.	
True/False (HP)	
Answer 1:	True
Response 1:	
Jump 1:	Next page
Answer 2:	False
Response 2:	
Jump 2:	This page

5.0 Summary.

This summary section will refer you back to the learning outcomes and summarise the notes.

Describe the main types of injury associated with manual handling;

Most injuries will fall into one or more of the following categories:

- Cuts and abrasions, mostly involving the upper body and limbs.

- Fractures, either as a result of falls or dropping heavy objects onto the body.
- Strains and muscle injuries involving the spine.
- Strains and muscle injuries involving other parts of the body.

Carry out a manual handling assessment;

1. Identify the hazards (anything with the potential to cause harm).
2. Assess the risks (the likelihood of the hazard causing actual harm or loss).
3. Consider the control measures that are currently in place.
4. Take account of the person or persons that may be at risk.
5. Implement additional controls to eliminate the risk or reduce the risk to an acceptable level.
6. Make a record of the assessment.
7. Maintain the assessment, monitor the activity assessed for changes.

Suggest ways of minimising manual handling risks;

Suggested measures to prevent/reduce injury can easily be remembered by using the TILE acronym:

TILE stands for Task, Individual capacity, Load & Environment.

The Task:

1. Redesign workplace layout.
2. Load to be placed in front of handler, as close as possible.
3. Handler to be able to walk around or rotate object.
4. Increase the workspace so feet and whole body can turn. If seated, give swivel chairs.
5. Raise working surface or provide adjustable height tables, re-design storage facilities/work place layout.
6. Lower storage level, raise working height of handler.
7. Provide mechanical aids e.g. trolleys or mid-point rest tables. Relocate work areas (make closer).
8. Provide mechanical aids, slides/chutes/rollers/trolleys, reduce size/weight of load, increase weight/size of load to force use of mechanical aid.
9. Provide adequate rest periods.
10. Vary tasks.
11. Specify team lift.

The Individual:

1. Health/pregnancy.
2. Age, strength, capacity.
3. Training on safe systems of work, manual handling.

The Load:

1. Reduce weight (or increase it excessively to force use of mechanical aids).
2. Provide handles.
3. Modify load.
4. Reduce size.
5. Pack contents so no shifting likely.
6. Prevent release if hazardous substances, e.g. dust

The Working Environment:

1. Re-design workplace layout.
2. Modify floor surface.
3. Ensure adequate lighting
4. Consider weather conditions, e.g. wind,rain.
5. Ensure good house keeping.

Work Organisation:

1. Re-design task to take account of personal protective equipment.
2. Train staff to team lift.
3. Ensure members of staff are available.
4. Plan the job.
5. Train staff to assess situations.

Explain the training requirements for those who are required to manually lift loads;

Training workers in manual handling techniques.

Assuming that manual handling cannot be avoided, it is clearly important that workers should receive appropriate training.

The risk to workers may be increased if they are unaware of basic information about the load (e.g. a possible risk of instability, abnormal centre of gravity), or if they do not understand the basic principles of safe manual handling techniques.

All staff should be aware of the following points:

1. How to recognise potentially hazardous handling operations.
2. How to deal with unfamiliar handling operations.
3. The proper use of any handling aids provided.
4. The proper use of personal protective equipment.
5. The importance of good housekeeping.
6. Features of the working environment that contribute to safety.
7. Factors affecting individual capability.
8. Good handling technique.

Where frequent heavy or specialised (e.g. team) lifting is routinely carried out, it is recommended that those involved in the work are provided with specialised training.

Explain the precautions and procedures necessary to ensure safety in the use and maintenance of fork-lift trucks, manually-operated load moving equipment, lifts, hoists, conveyors and cranes;

All lift trucks should be regularly serviced and maintained and this should be documented.

Drivers should check the vehicle before use and should include the following in the check:

- Tyre condition and pressure.
- Batteries fully charged.
- Lifting equipment working correctly.
- Brakes working correctly.
- Horns and audible and visual alarms working correctly.

- Lights working correctly.
- Mirrors clean and properly set.
- Secure and properly-adjusted seat.

An analysis of safe truck operation identifies three principal aspects as the potential cause of truck accidents: *THE DRIVER*, *THE TRUCK* and *THE SYSTEM OF WORK*.

Identify the legal requirements for the examination of lifting equipment.

Lifting Equipment Statutory Examinations.

Two terms are used in specifying examinations:

1. Inspection.
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The inspection is to identify whether the equipment can be operated, adjusted and maintained safely in order that any damage or defect can be detected at the earliest opportunity.

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5. As directed by a competent person if a specific examination schedule has been drawn up.
6. Where exceptional or unusual circumstances arise, such as severe weather conditions.

The competent person undertaking the inspection should notify the employer immediately of any defect and, as soon as is practicable (within 28 days), write a full report to the employer.

The initial report should be kept for the life of the lifting equipment. For all other examinations, a copy of the report should be kept until the subsequent examination and report has been produced and for a minimum of two years.

If any defects are found, then the appropriate enforcing authority should be informed by the person carrying out the examination.

The equipment should be inspected regularly, and at suitable intervals between statutory examinations.

6.0 Example Past Exam Questions.

In order to assist you with your exams and to get a better idea of what types of questions may arise

concerning this lesson, please see below some example past questions based around the content.

List 4 specific types of injury that could be caused by incorrect manual handling of loads

Identify the key stages that an employee should use when lifting

Identify 8 rules to follow when a fork lift truck is left unattended during a drivers work break.

Outline the precautions to be taken when using a mobile elevating work platform (MEWP) to reach a high point such as a street light.

(These questions are here just for reference so there are no answers provided)

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